Advancing Physiotherapy-Led Health Promotion to Decrease Cardiovascular Disease in Cameroon

Etienne Ngeh Ngeh

A thesis submitted in partial fulfilment of the requirements of Sheffield Hallam University for the degree of Doctor of Philosophy (article-based)

December 2024

Candidate Declaration

I hereby declare that:

1. I have not been enrolled for another award of the University or other academic or professional organisation whilst undertaking my research degree.
2. None of the material in the thesis has been used in any other submission for an academic award.
3. I certify that this thesis is my own work. The use of all published or other sources of material consulted has been properly and fully acknowledged.
4. The work undertaken towards the thesis has been conducted in accordance with the SHU Principles of Integrity in Research and the SHU Research Ethics Policy, and ethics approval has been granted for all research studies in the thesis.
5. The word count of the thesis is Approx. 40,000 words unpublished content and approx. 21,500 words published content.

(Signature) 

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Award	**Article Based PhD**
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Thesis Abstract

Background

Cardiovascular diseases (CVDs) and their associated risk factors are among the leading causes of illness and death globally, with particularly high impact in low- and middle-income countries such as Cameroon. Most individuals utilising physiotherapy services in Cameroon have CVDs, complications related to these conditions or present with cardiovascular risk factors. Physiotherapists play a major role in preventing and managing these health issues, with physiotherapist-led health promotion (PLHP) interventions shown to effectively enhance health outcomes for people at risk of or living with CVD (pwCVDs). However, the extent of Cameroonian physiotherapists' engagement in health promotion (HP) activities remains uncertain. Understanding patients' perspectives is essential for developing effective, contextually relevant PLHP interventions. This study aimed to explore PLHP from the viewpoints of both physiotherapists and pwCVDs to inform recommendations that can enhance HP practices in Cameroon.

Methods

This research was guided by a pragmatic philosophical approach and comprised four studies. Study one was a systematic scoping review which evaluated existing global evidence on PLHP. Study two was a national, cross-sectional survey of Cameroonian physiotherapists to examine their involvement in HP. Study three was a qualitative study conducted with Cameroonian physiotherapists to explore their perspectives on HP for pwCVD. Thematic content analysis was employed for data analysis using NVIVO 12. Study four was a sequential mixed methods study conducted with a sample of pwCVD in Cameroon to explore their perspectives upon and experiences of PLHP. The quantitative data was analysed descriptively, and a two-stage reflective thematic analysis was employed for qualitative data.

Results

Study 1: The systematic scoping review included 20 studies with varied populations, including those with stroke, coronary artery disease, peripheral artery disease, hypertension, diabetes and multiple risk factors. Identified HP strategies range from exercise and physical activity programmes, dietary interventions, education, and counselling sessions with various supplementary approaches. Study 2: the survey findings from physiotherapists revealed that of 181 respondents, 95% (n=172) reported delivering HP to pwCVDs, addressing various health behaviours. However, HP practices were generally unsystematic and influenced by intra and interpersonal, institutional factors. Study 3: qualitative data from 16 Cameroonian physiotherapists highlighted gaps in awareness and understanding of key health behaviour theories and concepts relevant to HP interventions and assessments. Study 4: the mixed-methods study indicated that pwCVDs expressed strong confidence in physiotherapists. In person treatment and dietary advice were deemed highly useful and acceptable.

Conclusion

Physiotherapists in Cameroon hold great potential to reduce the CVD burden. Despite evident interest and current participation in PLHP, the current approaches towards HP identified within this research programme were inconsistent and unsystematic. The variation in practices and lack of evidence-based approaches indicate a need for investment in capacity-building and comprehensive physiotherapy approaches that support long-term health and well-being. Recommendations are provided to enhance physiotherapy practice, public health messaging, and training, aligned with a healthcare model that shifts from "diagnose and treat" to "predict and prevent."

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Article Based Thesis

The format of an article-based thesis differs significantly from the traditional monograph-style PhD, though the regulations and assessment criteria for the degree remain unchanged. According to Sheffield Hallam University's guidelines, an article-based thesis consists of several research articles, typically between three and five, that the PhD candidate produces during their studies. These articles must either be published or accepted for publication in peer-reviewed journals by the time of submission.

In addition to the articles, the thesis typically includes an introduction that outlines the research question(s), the subject of study, relevant literature, and methodology, as well as a concluding chapter that summarises and discusses the research findings.

This article-based thesis consists of three articles that have been published in peer-reviewed journals, and one submitted manuscript. Each article reports on distinct, yet interconnected, projects that form part of the overall research programme, and they are presented within the thesis alongside an accompanying narrative.

Research Outputs, Contribution Statements and Permissions

Study 1

Title: Physiotherapy-Led Health Promotion Strategies for People with or at Risk of Cardiovascular Diseases: A Scoping Review

Authors: Etienne Ngeh Ngeh, Anna Lowe, Carol Garcia, and Sionnadh McLean

Full Reference: *International. Journal of Environmental. Research and Public Health* 2023, 20, 7073. https://doi.org/10.3390/ijerph20227073

Contribution Statement This piece of work was led by Etienne Ngeh Ngeh (ENN) who oversaw and was actively involved in all the research processes at each stage.

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Study 2

Title: A Survey of Practice and Factors Affecting Physiotherapist-Led Health Promotion for People at Risk or with Cardiovascular Disease in Cameroon

Authors: Etienne Ngeh Ngeh, Sionnadh McLean, Christopher Kuaban, Rachel Young and Joanne Lidster

Full Reference: *Clinics and Practice, 2024, 14, 1753–1766. https://doi.org/10.3390/clinpract1405014*

Contribution Statement This piece of work was led by Etienne Ngeh Ngeh (ENN) who oversaw and was actively involved in all the research processes at each stage.

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Study 3

Title: Cameroonian Physiotherapist's Practice, Confidence and Perception of Health Promotion for People at Risk or With Cardiovascular Diseases: A Qualitative Study (Preprint)

Authors: Etienne Ngeh Ngeh, Rachel Young, Christopher Kuaban, Sionnadh McLean, Ben W. Strafford, and Joanne Lidster

Full Reference:

Contribution Statement This piece of work was led by Etienne Ngeh Ngeh (ENN) who oversaw and was actively involved in all the research processes at each stage.

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Study 4

Title: People at Risk of, or with Cardiovascular Diseases' Perspectives and Perceptions of Physiotherapist-Led Health Promotion in Cameroon: A Mixed-Methods Study

Authors: Etienne Ngeh Ngeh, Sionnadh McLean, Christopher Kuaban, Rachel Young, Ben W. Strafford, and Joanne Lidster

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Abbreviations

BCT Behaviour Change Techniques

BI Brief Intervention

BS Ben Strafford

CG Carol Garcia

CK Christopher Kuaban

CNCD Chronic Non-Communicable Diseases

CVD Cardiovascular Diseases

ENN Etienne Ngeh Ngeh

HP Health Promotion

JL Joanne Lidster

MECC Make Every Contact Count

NCD Non-Communicable Diseases

PLHP Physiotherapist-Led Health Promotion

PO Programme Objective

PT Physiotherapist

pwCVD People at Risk or With CVD

RY Rachel Young

SM Sionnadh McLean

UK United Kingdom

Terminologies (operational)

HP: Health promotion is the process of enabling people to increase their control over and improve their health. It moves beyond a focus on individual behaviour towards a wide range of social and environmental interventions.

PLHP: Physiotherapy-Led Health Promotion refers to the approach within the field of physiotherapy that focuses on promoting overall health and well-being through education, lifestyle modification, and preventive strategies beyond acute care

pwCVD: People "at risk of, or with, cardiovascular diseases (CVDs)" refers to individuals who either already have cardiovascular disease or who have one or more risk factors that significantly increase their likelihood of developing CVDs. Cardiovascular diseases encompass a range of conditions affecting the heart and blood vessels, including coronary artery disease, heart failure, stroke, and hypertension.

Chapter One: Introduction and Context (Burden of Risk Factors and Cardiovascular Diseases in Cameroon)

1.1 Introduction

This chapter provides the foundation for the research programme, by introducing key information about the relationship between physiotherapists (PT), people at risk or with cardiovascular diseases (pwCVD) and health promotion (HP). It highlights the scale of the problem and why the research programme was necessary. The chapter also rationalises the need for change and outlines the purpose and contributions of the research programme. This is followed by a clear presentation of the research aims and objectives, along with an overview of the entire research programme. The chapter concludes by detailing the thesis structure and outlining the anticipated contributions to new knowledge.

1.2 Burden of Risk Factors and Cardiovascular Diseases in Cameroon

Cameroon is a lower-middle-income country in central Africa which is experiencing an epidemic of cardiovascular diseases (CVD) due to rapid epidemiological transition and adoption of Western lifestyles (Nkoke et al., 2019). Consequently, the prevalence of CVD has been increasing, attributed to the rising incidence of risk factors such as hypertension (Dzudie et al., 2019; Tchoumi & Butera, 2013), diabetes (*Cameroon National Diabetes and Hypertension Programme, WDF16-1429 | World Diabetes Foundation*, n.d.; Simeni Njonnou et al., 2020), and obesity (Lekoubou et al., 2015). In 2015, 30.8% of Cameroonian women were living with hypertension compared to 27% for both genders in Africa and 20.1% for women globally (*WHO | Country Statistics*, n.d.). Hypertension accounted for 41.3-54.49% of all hypertensive heart diseases in Cameroon (Akono et al., 2019; Nkoke et al., 2017). In one hospital-based study in Cameroon, CVD accounted for 10-16% of all hospital admissions (Nkoke et al., 2019). Approximately 26% of the Cameroonian population live with hypercholesterolaemia (*WHO | World Health Statistics 2016*, n.d.). Tobacco use among Cameroonian males aged 15 years and above was 43.8%, compared with global figures of 36.1%. Additionally, 28.5% of adults were physically inactive compared to 27.5% globally (*WHO | World Health Statistics 2016*, n.d.). In 2017, 37% of Cameroonian women over 25 years of age were overweight or obese (Aminde et

al., 2017). In 2012, 12% of the total Cameroonian deaths were attributed to CVD (*World Heart Federation | CVD World Monitor*, n.d.). A community-based cross-sectional study among Cameroonian adults reported poor awareness of CVDs and associated risk factors (Aminde et al., 2017). Awareness of risk factors and conditions is an important precondition for the prevention and control of these diseases in Cameroon (Aminde et al., 2017; Wijeysundera, 2010).

1.3 Social and Economic Impact of Risk Factors and Cardiovascular Diseases in Cameroon

CVD and risk factors place a significant economic burden on healthcare systems and wider society (Rosengren et al., 2019). Cameroon is undergoing a demographic transition, where the rise in non-communicable diseases (NCDs), such as CVD, are becoming more prominent than infectious diseases (Akono et al., 2019; Nansseu et al., 2019; Tchoumi & Butera, 2013). This shift presents a new set of challenges for individuals and families, as well as public health planning and resource allocation. There is a lack of up-to-date data on the economic burden of CVD in Cameroon.

CVD and their risk factors place a profound emotional and financial strain on individuals and families in Cameroon, where many pay out of pocket for healthcare (Aminde et al., 2021). This is further compounded by the evidence that the incidence of these conditions occurs at younger ages in Cameroon compared to global data. This has been reported for stroke leading to reduced productivity in working-age individuals (Nansseu et al., 2019; Tchoumi & Butera, 2013).

The economic impact associated with CVD and their risk factors in Cameroon are profound and include direct healthcare (diagnostic tests, cost of medications, hospitalisations and surgeries), loss of human capital and productivity (absenteeism, early retirement or death, caregiving burdens). The increasing burden of pwCVD places extra strain on the fragile healthcare system with competing priorities (infectious diseases) (Gheorghe et al., 2018; Mvondo et al., 2022; Tchoumi & Butera, 2013).

1.4 The Cameroon Health System and Physiotherapy Practice

The Cameroonian health system is structured into public, private, and traditional medicine sectors. It operates under a decentralized model, with healthcare services provided at different levels, from local health centres to specialized hospitals. However, the system faces several challenges, including inadequate funding, a shortage of healthcare professionals, and high out-of-pocket expenses for patients (giz, n.d.; *Ministry of Public Health Cameroon*, n.d.).

1.4.1 Structure of the Health System and Physiotherapy Practice

Cameroon's healthcare system is divided into three main sectors:

1. **Public Sector**: Managed by the Ministry of Public Health, it includes government hospitals, district health centres, and community health posts.
2. **Private Sector**: Includes private hospitals, clinics, and faith-based health facilities that complement public services.
3. **Traditional Medicine**: Many Cameroonians rely on traditional healers, herbal medicine, and spiritual practices for healthcare.

The Cameroon public health sector is further structured into three levels:

1. **Central Level:** Includes the Ministry of Public Health, central hospitals, and national reference laboratories.
2. **Intermediate Level:** Comprises regional hospitals and health delegations that oversee district healthcare activities.
3. **Peripheral Level:** Includes district hospitals, health centres, and community health workers providing primary care (*Ministry of Public Health Cameroon*, n.d.).

Physiotherapists in Cameroon practice in the public or private sectors with the majority working in both sectors. Specialised physiotherapists services do not exist such as geriatrics, cardiorespiratory or neurological services in practice. Physiotherapy services receive patients with all conditions and these services are available at all three levels in public sectors. This includes health centres, district, regional and central hospitals (*Cameroon Society of Physiotherapy*, n.d.; *Cameroon Society of Physiotherapy – The healing hands*, n.d.).

1.4.2 Health Financing

- Cameroon's healthcare financing heavily relies on out-of-pocket payments. National Health Insurance Scheme exists but covers only a small fraction of the population. Community-Based Health Insurance implemented in some areas but with limited coverage (Ntembe, 2023). The main sources of funding are presented in a tabulated form (giz, n.d.; Ntembe, 2023).

Source	Percentage
Out-of-Pocket Spending	~70%
Public Government Expenditure	~13%
Health Insurance & Private Funds	~9%
International Aid	~6%
Other Sources	~2%

1.5 Lifestyle and Behaviour Change Interventions in the Management of pwCVDs

Robust evidence suggests that pwCVD can modify their condition or risk factors through lifestyle changes such as increasing physical activity, adopting a healthy diet, avoiding smoking and stress reduction (Berendsen et al., 2020; Cai et al., 2008; Hayba et al., 2018; Sagastume et al., 2022). Health behaviour change, education and lifestyle management are regularly employed in the prevention and management of CVD with the advantage of safety and reduced cost (Mbada et al., 2023; Sheedy et al., 2000). The effectiveness of lifestyle changes are well established in primary, secondary and tertiary prevention and management of CVD (Frerichs et al., 2012; Kunstler et al., 2018, 2019; Sagastume et al., 2022)

HP and primary prevention aim to reduce the incidence of an index cardiac event, especially in those with multiple risk factors (Schloemer et al., 2021; Winnige et al., 2021). Despite the compelling need for a robust HP and prevention programme in Cameroon to address these concerns, existing efforts remain fragmented, under-resourced, and limited in terms of infrastructure. The Cameroon Ministry of Public Health has the Department of Health Promotion with a Division of Prevention and Community Action with no specific action plan (*Health Sector Strategy 2016 - 2027 | MINSANTE*, n.d.). Policy documents with proper implementation and dissemination strategies are yet to be developed (Douryang et al., 2023; Tatah et al., 2021).

Secondary and tertiary prevention programmes are directed at patients with CVD and are often provided at specialised Cardiac Rehabilitation (CR) centres with the aim of reducing the recurrence of cardiac events, restoring patients' quality of life, improving functional capacity, providing counselling support, teaching self-management techniques and promoting the adoption of a healthy lifestyle. Despite the known benefits of CR programmes and the burden of CVDs, many low- and medium-income countries, including Cameroon, have no existing structures that promote the prevention and

rehabilitation of patients with CVDs (16). Recent data shows the availability of CR to be as high as 80% in European countries and as low as 17% in Africa. In Cameroon, there are no existing CR programmes. Patients with CVD and complications are generally referred to physiotherapists for HP, secondary prevention and management. Physiotherapists are well placed to assume this role based on their professional training and skills in managing CVDs and leading HP and preventive interventions for this category of patients in Cameroon.

1.6 Physiotherapists Role in Health Promotion

Physiotherapists are specialists in non-invasive modalities such as health education and exercise prescription and are uniquely qualified and positioned to promote a healthy community through their practice (Dean et al., 2019; Healey et al., 2012). As the third leading healthcare profession after medicine and nursing (Mulcahy et al., 2010), and the leading profession that exploits non-medical and non-surgical interventions (Dean et al., 2019), physiotherapists need to take up their role in spearheading HP programmes (Albert et al., 2020; Berendsen et al., 2020).

As a result of the rising prevalence of risk factors, NCDs have increased globally over the last two decades following increased physical inactivity, overweight and obesity, and unhealthy diets as risk factors (Hajat & Stein, 2018). This has resulted in NCDs' lifestyle-related conditions such as ischemic heart disease, and hypertension-related conditions, stroke, cancer, type 2 diabetes mellitus, among others (Frerichs et al., 2012). Morbidity and mortality rates from NCDs have increased globally (Bigna & Noubiap, 2019; Hajat & Stein, 2018). Physiotherapists receive and manage most of these patients, with multiple opportunities to provide primary and secondary prevention interventions. This can improve health outcomes, reduce complications and provide long-term care (Heine et al., 2019).

Physiotherapy professional bodies encourage practitioners to adopt strategies that will reduce the prevalence of these conditions (Dean, 2009; D. Morris & Jenkins, 2018). Practitioners can implement HP strategies within their practice, which can potentially reduce the burden of NCDs and disability (Ontario Physiotherapy Leadership Consortium, 2011; Rawlinson, 2019). It is therefore necessary to adopt health-focused care in practice, considering the determinants of health and not only therapeutic interventions for physical health (Dean et al., 2019).

There is growing evidence that physiotherapists are increasingly participating in several components of HP, including physical activity (Rea BL et al., 2004; Shirley et al., 2010),

nutrition and weight management (Morris et al., 2009), smoking cessation (Bodner & Dean, 2009), improving sleep quality (Siengsukon et al., 2017), stress management (Lemyre et al., 2009) among others. There is evidence that physiotherapists are confident in providing counselling for several components of HP (Bodner et al., 2011; Laitakari et al., 1997). Frerichs and colleagues demonstrated that physiotherapists can effectively implement lifestyle-related interventions (Frerichs et al., 2012).

1.7 Transferability of Evidence

There is increasing robust evidence of physiotherapists developing and implementing HP within their practice globally (Bodner & Dean, 2009; Frerichs et al., 2012; Musonda & Simpamba, 2021). It is challenging to take an intervention employed in a 'developed' country and implement it in a 'developing' country (Schloemer et al., 2021). The challenges include the differing health service delivery models in different countries. What may be purchased through health insurance in one country may be freely delivered in another or available only through personal payment in another. Furthermore, the diversity, availability and accessibility of human resources varies widely between countries (Ba et al., 2021). Hence, HP practices in Cameroon will look different from those in other countries based on the available resources and health systems.

1.8 Purpose Statement

The burden of CVD and risk factors in Cameroon is huge and increasing above continental and global figures on a number of conditions (Dzudie et al., 2020). These chronic and lifestyle-related conditions can best be addressed through behaviour change interventions and therapeutic approaches (Barroso M et al., 2021; Dean, 2009; Frerichs et al., 2012). In Cameroon, there is poor investment and coordinated efforts even in policy documents to raise awareness and optimally address lifestyle conditions for pwCVDs (*Health Sector Strategy 2016 - 2027 | MINSANTE*, n.d.; *Ministry of Public Health Cameroon*, n.d.; Tatah et al., 2021).

A significant number of pwCVD visit and use physiotherapy services in Cameroon for several reasons and can benefit from a range of lifestyle interventions from physiotherapists (*Cameroon Society of Physiotherapy – The healing hands*, n.d.; *Physiotherapy Practice Start up, Cameroon*, n.d.). Physiotherapists are supposed to provide a range of HP interventions that can improve health and quality of life for those with risk factors or established CVD respectively in their practice (Frerichs et al., 2012). It is not known to what extent Cameroonian physiotherapists are contributing to

addressing lifestyle conditions as well as areas that require capacity strengthening and investment.

This programme of research explored contextual and contemporary perspectives of Cameroonian physiotherapists and pwCVD towards Physiotherapist-Led Health Promotion (PLHP). It seeks to better understand current HP practice and what optimal practice might look like based on evidence and highlights key issues in moving forward. The overarching aim is to generate evidence and recommendations for physiotherapists to provide effective opportunistic brief interventions for pwCVD in practice. The insights gained have the potential to inform and direct professional practice in Cameroon in the areas of lifestyle interventions from physiotherapy perspectives. This, in turn, has the potential to contribute to reducing the burden of CVD on the quality of lives of individuals, healthcare utilisation and cost to society. These interventions are likely to be acceptable and recognise the views and preferences of pwCVD.

1.9 Research Aim and Programme Objectives

The overarching research aim is to develop evidence-based PLHP recommendations for application in low-resourced settings like Cameroon for pwCVD.

The above research aim is underpinned by four principal programme objectives:

1. To systematically map existing PLHP strategies for pwCVD globally.

2. To examine current physiotherapy practice in HP for pwCVD in Cameroon.

3. To investigate the competence and confidence of Cameroonian physiotherapists in delivering HP for pwCVD

4. To explore the perspectives and factors influencing effective HP practice and adherence among pwCVD

1.10 Scope of Research

This research programme draws extensively from international literature, with a scoping review mapping global study on PLHP. It includes a mixed-methods study involving pwCVD, acknowledging the complexities and challenges of the PLHP. While the focus is specific to the Cameroonian context, the research also aims to learn from other systems approaches to embedding HP and advancing health equity. Though centred on Cameroon, the findings were expected to resonate beyond national borders, benefiting the broader physiotherapy community through shared goals and professional networks..

1.11 Thesis Structure

This section provides an overview of the research programme and the thesis structure (see Figure 1). The outline of the chapters and specific contributions to the entire thesis is outlined below.

Chapter One provides the background for the research programme, outlining its purpose, aims, and objectives. It offers a summary of the studies conducted and highlights the expected contribution to new knowledge.

Chapter Two discusses the methodology that underpins the research methods including the mixed methods approach, highlighting the justification and use of a sequential explanatory design.

Chapter Three: Study 1: Scoping review on Physiotherapist-led Health Promotion Strategies for pwCVD. HP is defined and aligned with how physiotherapists have used it globally in different patient populations. The specific strategies employed are also highlighted.

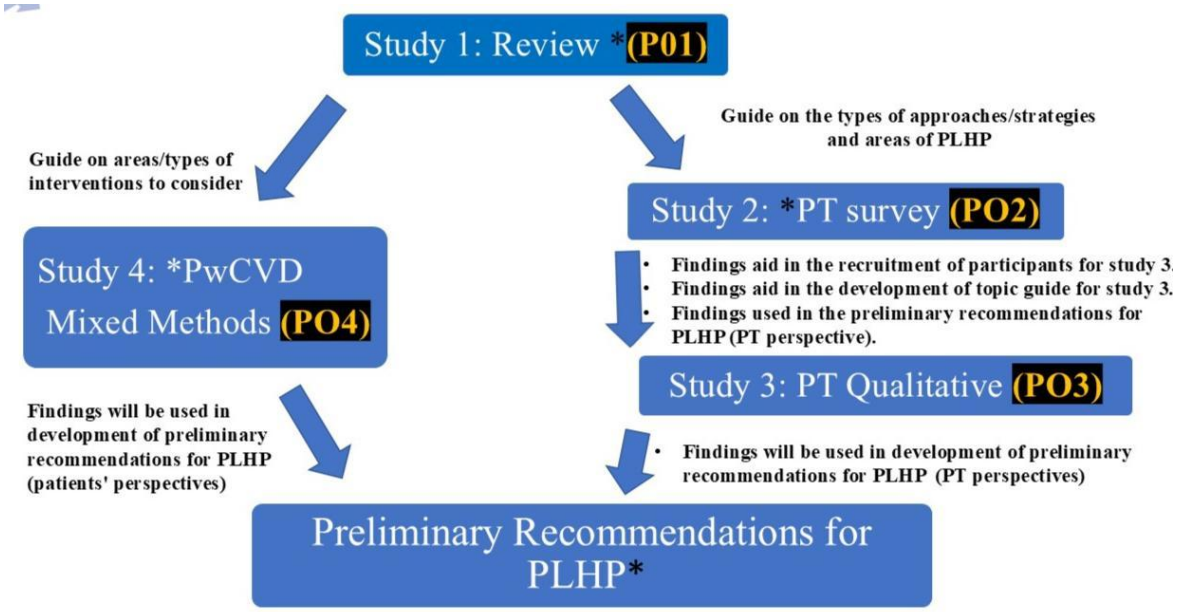
Chapter Four: Study 2: A Survey of practice and factors affecting physiotherapist-led HP for people at risk or with cardiovascular diseases in Cameroon. The survey provides data on current practices and areas of PLHP in Cameroon. The perceived confidence and factors affecting the HP practice are also reported in this chapter.

Chapter Five: Study 3: Cameroonian Physiotherapist's Health Promotion Practice for People at Risk or With Cardiovascular Diseases: A Qualitative Study. This chapter reports on the perceptions, confidence and challenges associated with training and delivery of HP interventions in the Cameroonian context.

Chapter Six: Study 4: People at Risk of, or with Cardiovascular Diseases' Perspectives and Perceptions of Physiotherapist-Led Health Promotion in Cameroon: A Mixed-Methods Study. This chapter reports on what pwCVD perceived as useful and acceptable and how interventions could be delivered. The possible challenges and areas for improvement in relation to physiotherapy education and training were also reported.

Chapter Seven: Discussion of Key Findings with Recommendations for Practice. This chapter collates and synthesises findings from this programme into recommendations that can be used to inform and improve both the training and delivery of HP intervention by physiotherapists for pwCVD in Cameroon.

Chapter Eight: Serves as the thesis conclusion, summarising the research findings and their significance. It reviews the research aims and objectives, emphasising the contribution of new knowledge gained from the study.



*PO: Programme objective, PT: Physiotherapists, pwCVD: People at risk or with cardiovascular diseases, PLHP: Physiotherapist-led health promotion.

Figure 1: Flowchart showing research programme objectives and how the studies relate to one another.

1.12 Anticipated Contribution of New Knowledge

New knowledge is generated by this research programme in a variety of areas, mapped to the specific research objectives, phases of study, and outcomes (see Table 1). To begin with, it collates the global literature on PLHP and provides a comprehensive review of the global evidence on strategies that have been employed and the population groups in this area that are up to date. In addition, the direction of future research is informed by gaps in the evidence that were not previously recognised.

Secondly, the findings generated by Study 2, (PO 2) provide the most comprehensive and up to date data on the existing strengths, areas of engagement and areas that need improvement on HP for Cameroonian physiotherapists for pwCVD.

Thirdly, study 3 provided knowledge on the perceptions, confidence and training needs of the Cameroonian physiotherapists towards PLHP for pwCVD. These studies aid in developing a better understanding and provide a more thorough picture of potential barriers and opportunities to building capacities among physiotherapists to address cardiovascular diseases and associated risk factors in Cameroon. Fourthly, study 4 provides data and a better understanding of perspectives and perceptions of pwCVD towards PLHP. It highlights what pwCVD perceived as useful and acceptable and how interventions could be delivered. The possible challenges and areas for improvement in relation to physiotherapy education and training were also highlighted.

Finally, the preliminary recommendations for pwCVD that will be tested through my post-doctoral work.

Table 1. Mapping Objectives with Study, Output and Anticipated Contribution of New Knowledge.

	Programme Objectives	Study design	Outputs	Anticipated Contribution of New Knowledge
1.	To systematically map existing PLHP strategies for pwCVD.	Scoping review	Study 1: Physiotherapy-Led Health Promotion Strategies for People with or at Risk of Cardiovascular Diseases: A Scoping Review	Provides a comprehensive review of the global evidence on strategies that have been employed and the population groups in this area that is up to date
2.	To examine current physiotherapy practices in the promotion of pwCVD in Cameroon.	Cross-sectional survey	Study 2: A Survey of Practice and Factors Affecting Physiotherapist-Led Health Promotion for People at Risk or with Cardiovascular Disease in Cameroon	Provide up-to-date data on the existing strengths, areas of engagement and areas that need improvement on HP for Cameroonian physiotherapists for pwCVD.
3.	To investigate the competence and confidence of Cameroonian physiotherapists in health promotion for pwCVD	Qualitative study	Study 3: Cameroonian Physiotherapist's Practice, Confidence and Perception of Health Promotion for People at Risk or With Cardiovascular Diseases: A Qualitative Study.	Provide up-to-date data on physiotherapists' practice, perceptions of their role, and confidence in delivering PLHP to pwCVDs in Cameroon.
4.	To explore the perspectives and factors influencing effective health promotion practice and adherence among pwCVD	Mixed-Methods Study	Study 4: People at risk of, or with Cardiovascular Diseases Perspectives and Perceptions of Physiotherapist-Led Health Promotion in Cameroon: A Mixed Methods Study	Provide data on the perspectives of Cameroonian pwCVDs' experiences, needs, and preferences regarding a PLHP intervention and its delivery.

1.12 Chapter Summary

Chapter 1 has set the scene for this research programme. PLHP has been outlined, including consideration of the scale of the CVD, risk factors, and implications in the Cameroonian context. This creates a compelling rationale for research that seeks to identify what should be included in a PLHP strategy for pwCVD in Cameroon and ultimately engage physiotherapists in addressing the burden of CVD. The four studies within this research programme have been outlined, and the anticipated contribution of new knowledge has been clearly identified. In addition, the content of the subsequent chapters has been described to help navigate this thesis.

The next chapter explore the relevant methodology and methods of the research programme.

Chapter Two: Methodology and Methods

2.1 Introduction

This chapter outlines the overall methodology of the research programme, detailing the theoretical foundations and key methodological concepts. It provides an in-depth overview of the methods applied in each research phase. To meet the programme's objectives, a range of study designs and data collection methods were necessary, including a scoping review, survey, qualitative research, and a mixed-methods sequential explanatory design. The chapter concludes with a discussion on reflexivity, acknowledging potential personal influences on the research process and how biases were mitigated.

2.2 Methodology

Methodology refers to the beliefs and processes that determine the choice of specific research methods (Al-Ababneh, 2020; Glogowska, 2010). Methodological choices are informed by a range of factors related to the nature of existence and what can be known in the social or natural world (ontology) and the nature of knowledge and how it is created (epistemology) (Al-Ababneh, 2020; Al-Saadi, n.d.; Bernabé et al., 2023).

Ontology explores the nature of being, existence, and reality. It seeks to understand what exists, the relationships, and the frameworks that describe their existence. It is concerned with whether social reality exists independently of human understanding and interpretation. For instance, is there a shared social reality or multiple context-specific realities (Ritchie et al., 2014)? Ontology underpins how a study defines the nature of the phenomena it investigates, providing the foundation for the questions researchers ask, the methods to employ, and the interpretation of the findings (Bernabé et al., 2023).

In relation to this PhD research project, evidence suggests that HP and disease prevention interventions for pwCVD in Cameroon will look different from those in Western countries due to social, cultural, human resources, economic, and political reasons (Ghisi et al., 2013; Sérvio et al., 2019; Turk-Adawi et al., 2019). Thus, the structure and mode of delivery will require investigation and interpretation for the Cameroonian context.

Ontology is associated with diverse schools of thought that reflect different perspectives on what exists and how it can be understood. An epistemological spectrum of ontology spans from realism to constructivism (Curry et al., 2009; Dowding, 2013). Realists assert that external objective reality is independent of people's beliefs and understandings. It distinguishes between how the world is and how people understand and interpret it (Sayer

& Tissaw, 2003; Yvonne Feilzer, 2010). In contrast, constructivism conveys that there is no single objective reality and proposes reality is shaped by human cognition and social interactions (Al-Ababneh, 2020; De Costa, 2016). There have been many discussions and modifications to these positions, with derivatives resulting from each position. In the realist's view, pwCVD should receive a standard intervention of HP with standard defined components that are accepted globally, with the justification that all human species, regardless of race and location on the globe, are more similar than they are different. Conversely, constructivists believe that an intervention for pwCVD may be refined by diverse factors. For example, healthcare providers and pwCVD may have different views and perceptions of what constitutes the best intervention for pwCVD in the Cameroonian context (Al-Ababneh, 2020; Ranalli, 2023).

Ontology plays a crucial role in underpinning and aligning epistemological stances and beliefs. Epistemology, the study of knowledge, includes various schools of thought, each addressing how knowledge is acquired, justified, and understood (Al-Ababneh, 2020; Ranalli, 2023). A positivist epistemology assumes that knowledge can be developed objectively, without any influence by researchers' or participants' values. Positivists assume that only "facts" derived from scientific methods can make legitimate knowledge claims (Al-Ababneh, 2020; McGlynn, 2013). Conversely, constructivists posit that knowledge is constructed through social and cultural interactions influenced by subjectivity and context in understanding reality (Al-Ababneh, 2020; De Costa, 2016). In one stance, some argue that it doesn't matter and it is true if it leads to or contributes to actions that accomplish the desired goals (pragmatism) (Ritchie et al., 2014). By validating knowledge through practical applications and outcomes, pragmatists focus on problem-solving and action to justify the knowledge acquired (Al-Ababneh, 2020; Ranalli, 2023). It can be deduced that pragmatism is more flexible (with both realist and constructivist views) and focused on desired goals. This project adopts this view as it acknowledges what is universally accepted (realism) and makes meaning to individuals (constructivism) to what is contextually relevant and useful in Cameroon for pwCVD.

Positivism (underpinned by realism) proposes that we "know truths" through experiments, tests, deduction, testing, and confirmation, and as such, it is aligned with quantitative approaches. Induction can help identify patterns and associations from observations of the world, while deduction involves deriving hypotheses through logical reasoning (Glogowska, 2010; McGlynn, 2013). Aligned with this philosophical stance, quantitative approaches were used to examine reported patterns and associations with

what constituted HP interventions for pwCVD among physiotherapists and pwCVD in the Cameroonian context.

Conversely, interpretivism (aligned with constructivism) believes there is no universally singular truth; that truth is plural and socially composed. This naturally leads to the adoption of qualitative methods and is often described as inductive inquiry (Glogowska, 2010; Ranalli, 2023). While this is a simplistic overview of these philosophical stances, it is important to note that diverse nuanced positions exist within the framework. However, realism and constructivism are the positions in epistemological debates in the social sciences (Ranalli, 2023; Ritchie et al., 2014). In line with this constructivist philosophical stance, qualitative interviews were conducted to explore what individuals consider relevant and promising interventions for pwCVD in the Cameroonian context. The reality of any PLHP is different in every context and influenced by different factors. What is perceived as reasonable and acceptable by pwCVD may vary across populations. In a typical scientific method informed by realist values, the investigation is independent of and unaffected by the researcher (Glogowska, 2010; Sayer & Tissaw, 2003). By contrast, qualitative approaches, based on constructivist values, acknowledge that most people are influenced by the process of being studied. Findings are either influenced by the researcher or mediated between the researcher and participant in such studies. For instance, being a Cameroonian physiotherapist with a personal understanding of Cameroon's health system and challenges will inevitably influence his beliefs of what constitutes the right HP interventions based on the resources available. This reflects a relativist ontology, which posits that reality is not absolute but depends on individual or cultural contexts (Al-Saadi, n.d.; Bernabé et al., 2023). The development of research questions and methods was grounded in the researcher’s epistemological understanding of the context (Al-Ababneh, 2020). By engaging both physiotherapists and pwCVD in Cameroon in the research programme, it was, therefore, necessary to adopt a constructivist perspective underpinned by the view that knowledge is constructed through social and cultural interactions. This indicates that selecting different research processes was influenced by the researcher's philosophical stance, which further underpins the epistemological beliefs. Epistemological beliefs, in turn, influence the choice of research questions and methods (Al-Ababneh, 2020). Hence, understanding these issues is important to inform decisions and to recognise the influence that these decisions may have. Empathic neutrality is a position that recognises that research cannot be value-free but encourages transparent assumptions among researchers (Kaushik & Walsh, 2019).

2.3 Research Paradigm

A paradigm can be regarded as the world views about what research is and how it is to be conducted (accepted model or organising structure) (Willis, 2007). In its deepest sense, it is a philosophical position about the nature of social phenomena and social structures, that influence an individual epistemological beliefs, which in turn influence the research questions and methods they choose (Glogowska, 2010).

Research paradigms direct the selection of research processes and can be adopted without other paradigms (Willis, 2007). Traditional paradigms provide guidance and are prescriptive in the sense that they require methods and exclude others (Kaushik & Walsh, 2019; Ranalli, 2023). Researchers are believed to decide research questions and methods based on their epistemological beliefs about the world. Methods, methodology, epistemology, and ontology should be aligned (Willis, 2007).

There is growing recognition that when it comes to addressing complex questions, it can be beneficial to consider a combination of qualitative and quantitative approaches, even though they reveal different perspectives (Curry et al., 2009; Ranalli, 2023). This perspective has led to the rise and increase in the use and application of mixed methods research globally. Constructionism and interpretivism are traditionally positioned as fundamentally opposed paradigms, as emerged from the conflict between qualitative and quantitative approaches (Creswell, 2017; Dowding, 2013).

An alternative approach to qualitative and quantitative approaches has been mixed methods approaches, viewed as an answer to the enduring circular debates about their relative strengths and weaknesses (Creswell, 2017). Advocates of mixed methods research attempt to synergise quantitative and qualitative research strategies for better outcomes; however, this does not fit neatly into either accepted paradigm. Consequently, leading to alternative frameworks constructed to contain the diverse nature of research in this area (Dowding, 2013). For instance, a mixed methods approach was adopted to quantify existing practice (quantitative) and understand the perspectives of the participants (qualitative) in this research program. Amongst mixed methods research approaches, pragmatism is most commonly associated, as it focuses primarily on the research problem and its consequences (Willis, 2007).

In addition to philosophical debates, pragmatic factors have increasingly played a role in method selection (Kaushik & Walsh, 2019). Research questions may be thwarted by perfectionist debates about epistemology overshadowing and ultimately impairing practical decisions (Glogowska, 2010). However, it is imperative to find useful balance

between underpinning philosophy and the practicalities of any research investigation (Kaushik & Walsh, 2019).

The pragmatic approach recognises the ongoing debate between realism and constructivism but chooses to focus on its purpose and consequences instead (Gutmann, 2014; Kaushik & Walsh, 2019). It rejects the idea that all knowledge comes from the mind and offers a new way of conceptualising epistemology and definitions of knowledge. Its two key tenets are first, the importance of practical activity as a test of knowledge, and second, that knowledge is evaluated according to its application (Kaushik & Walsh, 2019). Its pluralistic nature accommodates diverse competing interests and creates its own understanding (Willis, 2007).

Taking the pragmatic approach, one rejects the idea that research questions, methods, methodologies, epistemology, and ontology should conform to a particular paradigm. Instead of being dictated by paradigms, pragmatism suggests that research questions should drive research design selection (Allemang et al., 2022; Kaushik & Walsh, 2019). In line with the pragmatic paradigm, this research programme explored and utilised human experience as a means for building knowledge and understanding of PLHP for pwCVD in the Cameroonian context, as opposed to relying on absolute truths (Allemang et al., 2022). A range of feasible and practical approaches were employed with a range of methodological preferences to better address contextual issues.

After careful appraisal of the theories and philosophies, pragmatism is the theoretical standpoint that underpins this research programme, as it accommodates key philosophical views, yet accepts the need to work with limited resources and the inevitability of exploring and using both quantitative and qualitative information to answer practical research questions.

2.4 Methods

Meeting the programme objectives required establishing current practice and in-depth exploration of both physiotherapists and pwCVD perspectives on PLHP. No single research method was sufficient to meet the requirements of both, and therefore, a mix of methods was used. These multiple methods included a systematic scoping review, surveys (quantitative) and qualitative approaches. This programme was implemented in four studies and adopted the recommendations for developing a complex intervention which proposes identifying existing evidence, developing theory, and modelling processes and outcomes (Craig et al., 2008, 2013). Detailed theoretical underpinnings supporting each output are discussed in the respective chapters.

2.4.0 Review Design

A systematic scoping review was used to map PLHP strategies for pwCVD from existing literature (study 1). The study offered a structured approach to mapping existing strategies, evidence gaps, and research trends on PLHP for pwCVD globally. Unlike systematic reviews, scoping reviews prioritise breadth over depth, making them particularly suitable for exploratory research (Munn et al., 2018). For this research programme, the scoping review clarified research questions, summarised interventional strategies and informed all primary studies by synthesising diverse evidence on PLHP (Arksey & O'Malley, 2005; Daudt et al., 2013; Munn et al., 2018). By systematically charting the scope of existing literature, the scoping review established a solid foundation for the research programme direction, ensuring the originality and relevance of the primary studies (Daudt et al., 2013; Levac et al., 2010). Due to the exploratory nature of the study, most cited limitations of scoping reviews, such as limited depth, lack of risk of bias and quality assessments, were not observed as limitations to the study (Daudt et al., 2013; Levac et al., 2010). Further limitations were minimised by adopting up-to-date methodological frameworks (Arksey & O'Malley, 2005; Levac et al., 2010) and recommended standards for scoping reviews (Page et al., 2021; Tricco et al., 2018)

2.4.1 Survey Design

Survey design was employed in two studies (Study 2 & 4). Both were designed as online cross-sectional studies for physiotherapists (study 2) and pwCVDs (study 4) in Cameroon. This method offers several advantages, including increased reach and number of responses, especially with the use of the internet and digital technology (Owan et al., 2021; Ross-Hellauer et al., 2020). The ease of result management and the immediate reception of the results are also core advantages employed in this project. Potential limitations such as lack of representativeness, selection bias, and susceptibility to error rates were minimised by adopting and using standard guidelines for conducting and reporting survey research (Andrade, 2020; Ball, 2019; Field et al., 2014; Owan et al., 2021). Additionally, the supplementary use of qualitative methods (study 4) further minimised the limitation and increased the rigour of the research programme.

2.4.2 Qualitative design

This research programme employed a qualitative research design to explore the practice and perceptions of physiotherapists on HP for pwCVD (study 3) and as a component of the mixed methods study (study 4). The participants (study 3) were recruited during data collected for the quantitative study (study 2). A semi-structured interview was conducted

among practising physiotherapists in Cameroon. The use of qualitative research design offered deep insights into the practice, perspectives and perceptions of physiotherapists on HP for pwCVD, as well as contextual factors, which are difficult to quantify (Creswell & Poth, 2016). The qualitative findings offered valuable insight, explaining and supporting the findings of study 2. It enabled flexibility in exploring complex phenomena and uncovering new insights into the concept of PLHP for pwCVD. It was particularly effective in capturing participants' perspectives and understanding subjective meanings and challenges in context (Ritchie et al., 2014). A limitation associated with qualitative research is generalizability due to small, non-random samples (Creswell & Poth, 2016; Holloway & Galvin, 2016). The interpretative and subjective nature of qualitative design can introduce researcher bias, making validation and replication challenging (Gutmann, 2014; Holloway & Galvin, 2016). The potential limitations of the qualitative design were minimised by adopting and following standard recommendations for conducting and reporting qualitative studies (O'Brien et al., 2014)

2.4.3 Strategies to Ensure Quality in Qualitative Components

Maintaining ethical practice and high standards in conducting and reporting qualitative research was mandatory and adopted for all qualitative components of the research programme including study 3 (qualitative study) and study 4 (mixed methods study). Robinson identifies widely accepted standards for quality in qualitative research, including confirmability, dependability, credibility, and transferability (Robinson, 2014).

Confirmability assesses how well the findings reflect the focus of the inquiry rather than researcher bias. In both components, confirmability was strengthened by maintaining a clear audit trail during data analysis, which enhanced transparency between the data analysts (ENN and BWS), the research team and the peer review team. Additionally, a reflexive journal documented key points on the researcher's role and potential influence, with entries reviewed regularly with the supervisory team as part of an ongoing peer review process.

Dependability addresses the need for an audit trail to track variability in research processes (Nakkeeran & Zodpey, 2012; Robinson, 2014). Although differences between participants and contexts are expected, sufficient details should be provided to allow an external evaluator to judge if the variation is justifiable (Nakkeeran & Zodpey, 2012; Robinson, 2014). In these studies, a well-documented audit trail of all procedures enhances transparency, supporting an understanding of the observed variations in the qualitative study.

Credibility refers to the trustworthiness of the findings, relying on the researcher's interpretation of complex data (Nakkeeran & Zodpey, 2012). In this research, credibility was supported by selecting methods, such as semi-structured interviews, that allow flexibility to explore participant-specific nuances. Additionally, the rigorous data analysis process, requiring deep engagement with the data, strengthens the credibility of the findings. The reflexive journal also enabled transparency regarding the researcher's role. For instance, two researchers were involved in the qualitative data analysis. The codes and themes were identified and developed independently. Reflection and refinement of the themes were discussed, and supporting codes were identified. There was an iterative process further reviewed by other members of the research team until a consensus was reached.

Transferability involves assessing whether findings apply to other contexts (Petty et al., 2012). Qualitative research relies on collecting detailed "thick descriptions" to provide a rich account of the phenomena, enabling others to judge the relevance to their contexts (Nakkeeran & Zodpey, 2012; Robinson, 2014). These studies carefully described methods, participant characteristics, and methodological approaches to aid other researchers in determining the transferability of the findings. The lead researcher's (ENN) extensive experience and familiarity with the study context as an insider researcher further facilitated the collection of comprehensive descriptions.

To ensure adherence to best practices, several established quality frameworks guided the research and reporting. For example, Braun and Clarke's six steps and two stage approaches for effective thematic analysis was followed during data analysis (Braun & Clarke, 2006, 2019). Additionally, the final report was prepared following the standards for reporting qualitative research (O'Brien et al., 2014).

2.5. Mixed Methods Design

Mixed methods research is broadly defined as integrating both qualitative and quantitative approaches within a study's methodology (Creswell, 2017; Ivankova et al., 2006). Core characteristics of mixed methods include collection and analysis of both quantitative and qualitative data, framed within philosophical worldviews or theoretical lens, using research designs that match the research question, integrating two forms of data, and employing rigorous processes when using both forms of data (Creswell, 2017; Teddlie & Tashakkori, 2012)

Mixed-methods studies combine the numerical precision of quantitative data with the depth of qualitative insights, allowing for a more holistic analysis and providing more complete answers to research questions (O'Cathain et al., 2014; Venkatesh et al., 2016). Three identified advantages of mixed-method research include: 1) enabling researchers to evaluate and generate theory while simultaneously addressing confirmatory and explanatory research questions; 2) researchers can offer stronger conclusions than if they used only one method; and 3) researchers can produce a broader range of findings based on different perspectives and minimise weakness of both methods (Venkatesh et al., 2016). It allowed for participants' experiences of PLHP (qualitative) to be combined with study measurement (quantitative) and assisted with the development of PLPH interventions.

Mixed method research is used to understand complex issues (Dowding, 2013). PLHP is poorly understood, especially in low-resource settings like Cameroon, and little is known about patient experiences and perceptions of PLHP (Ngeh, McLean, Kuaban, Young, & Lidster, 2024; Ngeh, McLean, Kuaban, Young, Strafford, et al., 2024). This research programme adopted a sequential mixed methods design for study 4 (Ngeh, McLean, Kuaban, Young, Strafford, et al., 2024). The first phase employed a cross-sectional survey method, and the analysis of the qualitative data in the second phase aided in explaining and adding meaning to the findings of the first phase by exploring patients' experiences, views and perceptions in more depth (Ivankova et al., 2006). Hence, these methods allowed the overarching aims of exploring and understanding patients' perspectives and perceptions towards PLHP and contributing to a broad and stronger theory generation to support the development of a PLHP intervention suitable and acceptable for the Cameroonian context.

2.5.1 Sequential Explanatory Design

A sequential explanatory design was chosen as the most appropriate mixed method (Ivankova et al., 2006; Meixner & Hathcoat, 2019). Using sequential explanatory design, quantitative data is first collected and analysed, followed by the collection and analysis of qualitative data to clarify or expand on the quantitative findings (Meixner & Hathcoat, 2019). The qualitative phase builds on and is informed by the initial quantitative phase, with both phases linked at specific, planned points in the study (Meixner & Hathcoat, 2019; Venkatesh et al., 2016). As shown in Figure 1, the first phase is a quantitative cross-sectional survey of pwCVDs, and the second phase is a qualitative explanatory study. The analysis from the quantitative survey guides the subsequent qualitative phase. The second

phase supported and provided an explanation of quantitative findings elaborating the perspectives and perceptions of pwCVDs (Ngeh, McLean, Kuaban, Young, Strafford, et al., 2024). Together, these methods enable the comprehensive goal of examining practice and the factors influencing pwCVDs' adherence to PLHP to be achieved.

This study employed the participant selection variant of the sequential explanatory design (Meixner & Hathcoat, 2019), a specific type of approach where characteristics from the quantitative participants guide purposeful sampling for the qualitative phase. Key features of participants' self-reported perspectives and perceptions of PLHP informed the sampling for the second phase, ensuring a range of viewpoints was included and identifying participants best suited to expand upon the quantitative findings (Ngeh, McLean, Kuaban, Young, Strafford, et al., 2024).

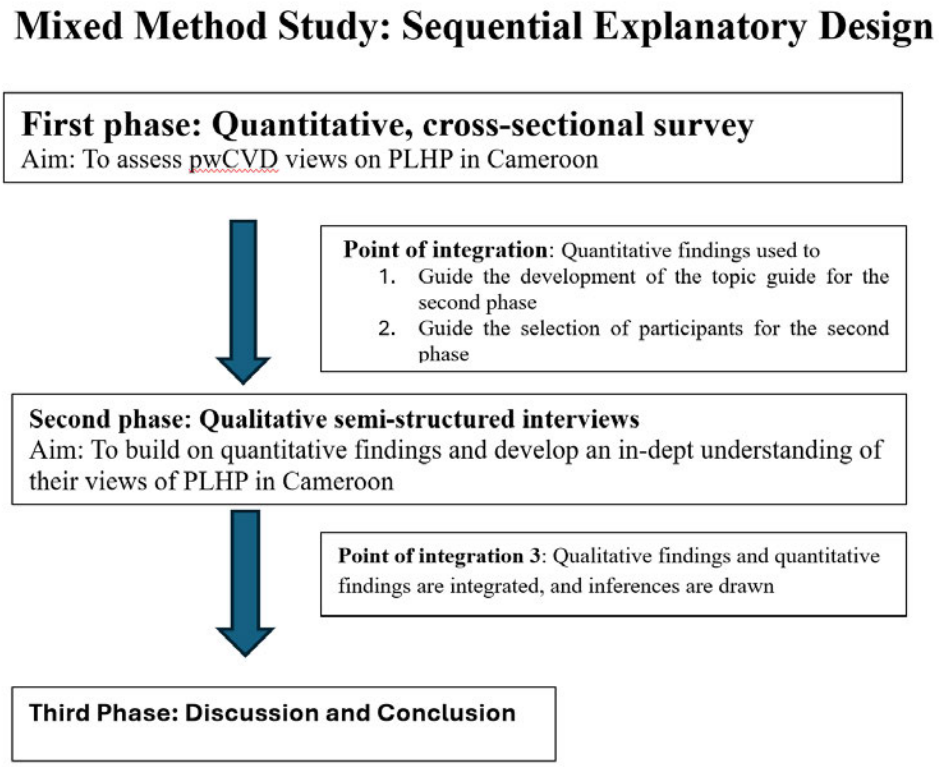


Figure 2. Flowchart showing the three phases of the mixed methods study with points of integration highlighted.

2.5.2 Priority in the Sequential Explanatory Design

In a sequential explanatory design, priority refers to the emphasis a researcher places on either the quantitative or qualitative strand (or both) during data collection and analysis (Creswell, 2017; McBride et al., 2019). In this mixed methods study, equal priority was given to both components, the quantitative survey data and qualitative interview data, as both were essential for achieving the study's research objectives as well as the aim of the research programme (Ngeh, McLean, Kuaban, Young, Strafford, et al., 2024). Additionally, the two phases were interdependent; the quantitative data alone offered only limited insights without further qualitative exploration of the underlying perspectives and perceptions of pwCVDs in practice. Likewise, the qualitative phase relied on the quantitative findings to guide sampling, ensuring the recruitment of participants who could best inform the research questions.

This approach has faced criticism for lacking a clearly defined and respected dominant theoretical direction, with proponents arguing that it lacks clarity in research focus, resource management and enhanced validity (Ivankova et al., 2006; Morse, 2016). Critics have also argued that mixed methods research should establish a primary qualitative or quantitative focus aligned with its theoretical direction. This stems from the idea that combining conflicting philosophical paradigms within a single study can weaken the credibility of its foundational theory and philosophical assumptions. These criticisms are addressed by adopting pragmatism as the theoretical perspective for this study, where qualitative and quantitative approaches are seen as complementary and essential to answering the research questions. As a result, priority is equally shared between the quantitative and qualitative components. This is in line with some mixed methods researchers who argue that priority may only sometimes be essential, especially in fully integrative mixed methods where both phases are equally critical. Furthermore, some noted that studies seeking a holistic understanding may benefit from equal weight to both phases, allowing for a more comprehensive exploration without inherent bias (Creswell & Clark, 2017; Creswell & Inoue, 2024).

2.5.3 Integration of Quantitative and Qualitative Findings in Sequential Explanatory Design

In sequential explanatory studies, *integration* refers to the specific points in the research process where quantitative and qualitative methods are combined (Creswell & Clark, 2017; Creswell & Inoue, 2024; Morse, 2016). Integration can occur at various stages:

during the initial phase, when establishing the study's purpose and research questions (Teddlie & Tashakkori, 2012), at an intermediate stage, where data analysis from the first phase informs the second phase's data collection (Creswell & Clark, 2017), and at the interpretation stage, where quantitative and qualitative findings are synthesised (Creswell & Inoue, 2024). In this mixed methods study, three key points of integration are clearly identified and represented in Figure 2.

Point of Integration 1: The initial integration point occurred as the quantitative survey data informed the qualitative protocol development. In this phase, qualitative exploration builds on the quantitative findings, so the interview protocol and topic guide were shaped directly by survey results (Ivankova et al., 2006).

Point of Integration 2: The second integration point was in the participant selection process for the qualitative study, guided by quantitative findings. Survey responses enabled the categorisation of participants based on their gender, condition, region, and duration of receiving physiotherapy intervention. This distinction supported a quota sampling strategy, ensuring that perspectives from both groups are captured to deepen understanding of their perspectives and perceptions.

Point of Integration 3: The final integration point was in generating meta-inferences after completing the qualitative phase. These meta-inferences reflect cumulative insights from both quantitative and qualitative phases, contrasting with other mixed methods that may combine findings only during the final analysis (Creswell & Clark, 2017). Integration in sequential explanatory designs emphasises the influence of each phase on subsequent stages, enhancing cumulative learning throughout the study process (Creswell & Inoue, 2024; Ivankova et al., 2006).

2.5.4 Rigour in Mixed Methods Research

In mixed methods research, *rigour* refers to the thoroughness, accuracy, and credibility with which both qualitative and quantitative components are designed, conducted, analysed, and integrated to provide trustworthy results. Rigour is essential in demonstrating that the findings are valid, reliable, and meaningful. In mixed methods, rigour encompasses careful attention to the methodological strengths of both qualitative and quantitative strands while ensuring that the integration of these approaches yields insights that neither alone could provide (Creswell & Clark, 2017; Creswell & Inoue, 2024).

It is essential to minimise threats to validity not only within the individual quantitative and qualitative strands but also throughout the process of integrating these datasets. In mixed methods research, *validity* involves "employing strategies that address potential issues in data collection, data analysis, and interpretations that may compromise the merging or connecting of the qualitative and quantitative strands of the study and the conclusions drawn from their combination" (Creswell & Clark, 2017)

Several potential validity threats specifically related to integrating data in mixed methods research, which must be addressed alongside those associated with each standalone method, have been identified (Creswell & Clark, 2017; Ivankova et al., 2006). Key threats arise when unsuitable participants are chosen for the qualitative and quantitative phases. To address this, sampling strategies were deliberately chosen and well-documented. Specifically, selecting qualitative participants from the initial quantitative respondent pool enabled purposeful sampling, targeting individuals best suited to answer the research questions. For example, participants were chosen based on their gender, condition, region and duration of receiving physiotherapy intervention, among others, facilitating quota sampling that ensured diverse perspectives were included, ultimately supporting the study's objectives.

An often-cited challenge to the quality of qualitative research is the use of inappropriate sample sizes (Creswell & Clark, 2017). Following established guidance, an adequate sample was employed for the quantitative phase, with a smaller, focused sample for the qualitative phase (Ngeh, McLean, Kuaban, Young, Strafford, et al., 2024).

Another frequent threat is selecting participants for the qualitative follow-up phase who are not well-suited to help explain significant quantitative findings. To mitigate this, participants for the qualitative phase were purposefully selected from the initial quantitative sample based on key characteristics to ensure a broad range of perspectives meeting the objectives of the study.

Also, methodologists note that improper integration techniques, such as comparing data that should instead be merged, can compromise study quality (Creswell & Clark, 2017; Creswell & Inoue, 2024). This study addressed these concerns by clearly defining integration points and comparing and merging data where appropriate in the analysis and reporting. Specifically, the qualitative findings were designed to build upon the quantitative results, a strategy outlined from the study's outset and documented throughout. Additionally, a narrative interpretation approach—a widely accepted

integration method in sequential explanatory designs—was used to combine the qualitative and quantitative insights effectively(Carter et al., 2014; Olsen, n.d.).

2.6 Reflexivity

In the qualitative and published mixed methods articles, reflexivity was briefly addressed; this section expands on its significance. Reflexivity is widely understood as an ongoing internal dialogue and critical self-assessment of a researcher's positionality, along with active acknowledgement of how this position may shape the research process and outcomes (Olmos-Vega et al., 2023). Reflexive practice is part of a broader discourse on ontological, epistemological, personal values, intersubjectivity, and societal influence (Corlett & Mavin, 2018). It involves shifting the research lens back onto the researcher, promoting an awareness and acceptance that their presence and perspective can affect the research setting, the questions posed, the data collected, and its interpretation. Reflexivity thus challenges the idea that knowledge production cannot be wholly independent of the researcher, acknowledging their influence on the research (Corlett & Mavin, 2018; Hellawell, 2006).

Personal characteristics influencing the researcher's perspective—such as gender, race, affiliations, age, sexual orientation, immigration status, personal experiences, linguistic background, beliefs, biases, preferences, and theoretical, political, or ideological stances—have been documented (Finlay, 2002; Hellawell, 2006; Olmos-Vega et al., 2023). Berger categorised factors influencing research into three primary domains: field access, researcher-participant relationships, and worldview (Berger, 2015). Here, relevant personal characteristics are evaluated within each of these categories.

The Field

Access to the field may be enhanced when respondents perceive the researcher as empathetic or knowledgeable about their area and circumstances. The sampling frame included physiotherapists practising in Cameroon and pwCVDs receiving physiotherapy intervention in physiotherapy services in Cameroon. As a Cameroonian physiotherapist registered with the Cameroon Society of Physiotherapy (CASP), I remain professionally connected and have an interest in promoting cardiovascular health in physiotherapy practice. My public profile in this area likely contributed positively to survey response rates and facilitated qualitative recruitment. Recruitment for the qualitative component was notably swift, with participants expressing eagerness to stay informed about the study

outcomes. Familiarity with healthcare contexts allowed me to engage deeply during interviews, posing relevant questions flexibly and sympathetically.

The Relationship

The researcher-participant dynamic varied and was influenced by participants' clinical specialities, healthcare settings, and professional experience. Some participants recognised my prior work, possibly impacting interview dynamics. One participant, for example, seemed eager to impress, perceiving me as an expert. While insider knowledge facilitated rapport and adaptability in interviews, it sometimes created a challenge between maintaining a professional tone and engaging as a peer. This was so evident, given my prior role as a physiotherapy trainer in one of the leading private higher institution training physiotherapists in Cameroon (St. Louis University Institute of Health and Biomedical Science, Douala, Cameroon). With some participants, previous students, the power dynamic felt distinct, as they appeared apprehensive, possibly feeling evaluated or assuming a learning position. To mitigate this, I began each interview by affirming that there were no right or wrong answers and secondly that the primary aim was to gain insight into views and perspectives concerning their actual practice. I emphasised that accurately portraying the practice context was more valuable than attempting to present an overly idealised or impressive version of the practice. These steps might not have fully addressed the perceived power imbalance but mitigated it.

Worldview

A researcher's worldview, shaped by personal and professional background, inevitably influences the framing of questions, data interpretation, and meaning-making. My career spans over a decade in clinical practice, more than ten years in higher education teaching and training, and five years of active collaboration on national and international health initiatives. This has shaped my perspectives on physiotherapy service delivery. This professional trajectory, coupled with a commitment to liberalism, equality, and social justice, aligns me more closely with a social model of health and a constructivist approach to knowledge. While these biases are overt, awareness of them allowed me to monitor and mitigate their influence actively. Reflective journaling and frequent supervisory debriefs were employed as strategies to critically examine and manage any undue bias (Corlett & Mavin, 2018).

Throughout the research programme, my strong and diverse supervisory team, experts in related physiotherapy fields but somewhat removed from my specific area, ensured an

objective approach to data acquisition and analysis. Discussions on coding frameworks and maintaining a transparent audit trail further bolstered reflexivity, aiming to enable third-party evaluation of the research process and any unconscious biases.

In conclusion, I acknowledge my conscious and unconscious biases, aware that personal, social, and cultural factors inevitably shape the research process (Berger, 2015; Braun & Clarke, 2006, 2019). My worldview has undeniably influenced the research; however, through sustained self-awareness and collaborative efforts, I believe that the confirmability, dependability, credibility, and transferability of the findings have been robustly maintained.

2.7 Chapter Summary

This chapter has presented the fundamental concepts that form the basis of this research program, encompassing pertinent philosophical perspectives and research paradigms. It outlines the principles of mixed methods research and provides a rationale for their selection. Key methodological considerations are addressed, with justifications for choosing a mixed methods approach. The chapter also explores the notion of validity in mixed methods research and details the strategies implemented to ensure rigour. This establishes the foundation for the specific methods used in each phase, which are detailed in the published articles. The chapter concludes with a discussion on reflexivity, acknowledging potential personal influences on the research process and potential biases were mitigated.

The next chapter explores the main concepts relevant to the research programme including the published peer reviewed scoping review (Study 1).

Chapter Three: Physiotherapist-led Health Promotion Strategies for People with or at Risk of Cardiovascular Diseases; A Scoping Review (**Study 1**)

3.0 Introduction

This chapter provides an in-depth review of the relevant literature on health and HP, building upon an existing systematic scoping review of PLHP strategies by including recent publications. The chapter highlights the scoping review's findings, focusing on their implications and contributions to the research programme, particularly in addressing its first objective. It concludes by examining factors influencing HP among physiotherapists, identifying opportunities to enhance practice in low-resource settings such as Cameroon.

3.1 Health

The World Health Organisation (WHO) constitution defines health as 'the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (*Constitution of the World Health Organization*, n.d; Huber et al., 2011). Health is more than just a lack of disease in many domains. Every human being has the right to enjoy the highest possible standard of health (*Constitution of the World Health Organization*, n.d.). There has been some evolution in the definition of health since its conception by WHO in 1948. Recently, Huber and colleagues proposed a new concept of health as "the ability to adapt and to self-manage" in social, physical, and mental domains (Huber et al., 2011). This proposed definition acknowledges the fact that people with long-term conditions can still be healthy. Hence, attention is shifted from "complete" or perfect health with a focus on the ability to thrive through life's inevitable challenges (Huber et al., 2016).

Health has been viewed and defined based on three different models. These include the medical, holistic and wellness models (Svalastog et al., 2017). In the medical model, the body is viewed as a machine that must be repaired when broken. It focuses on treating specific physical diseases without emphasis on prevention. Also, it does not accommodate other domains like mental or social issues. In this model, health is viewed as the absence of disease and the presence of high levels of function. The holistic model was defined by WHO in 1948 as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". Through this model, a broader perspective was provided compared with the medical model, and a measure of well-being was

included. In 1985, WHO's health promotion initiatives championed the wellness model. Based on this model, health was defined as "The extent to which an individual or group can realise aspirations and satisfy needs, and to change or cope with the environment. Health is a resource for everyday life, not the objective of living; it is a positive concept, emphasising social and personal resources, as well as physical capacities." (Svalastog et al., 2017). These changing attitudes to health have led to an emphasis on public health and health promotion (Larson, 1999).

3.2 Public (Population) Health.

The science of public health aims to protect and improve the health of communities. According to WHO, 'Public health refers to all organised measures (whether public or private) to prevent disease, promote health, and prolong life among the population. Its activities aim to provide conditions in which people can be healthy and focus on entire populations, not on individual patients or diseases' (Azari & Borisch, 2023; Lategan et al., 2022). There are three overlapping strands of public health, commonly referred to as the '3Ps'. They are health promotion, prevention of diseases and protection of health. (*AFMC Primer on Population Health*, n.d.).

3.2.1 Health Promotion

Health promotion aims to enhance health by promoting healthy public policies, healthy environments, and healthy individuals; this reflects a philosophy that supports communities and individuals to take charge of their health (World Health Organization. Regional Office for Europe, 1984). The Ottawa Charter's definition is "Health promotion is the process of enabling people to increase control over, and to improve their health" (*Ottawa Charter for Health Promotion*, n.d.). Several stakeholders are responsible for developing and delivering health promotion services, including individuals, community groups, health professionals, health services, and governments. The Ottawa Charter also highlighted five strategies and seven prerequisites for health promotion as follows:

1. **Building healthy public policy**. Health needs to be on every policymaker's agenda, and their decisions should contain health implications. A healthy public policy is one that does not damage health for the sake of achieving some other goal.
2. **Creating supportive environments.** This suggests a socio-ecological approach to health, recognising the impact of natural, built, and social environments on health.

3. **Strengthening community action**. To promote better health, the community must take an active role in setting priorities, planning, and implementing strategies.
4. **Developing personal skills**. Promoting health increases life skills and promotes social and personal development.
5. **Re-orienting health services**. In health promotion, emphasis is placed on shifting health resources to prevent disease as well as treat it. This involves transforming the system from concentrating solely on disease treatment to embracing a person-centred approach that looks at health in a holistic way (Huber et al., 2016; Ottawa Charter for Health Promotion, n.d.). Some of the goals of re-orienting healthcare services are to strike a better balance between investing in prevention and treatment and prioritising population and individual health outcomes (Wise & Nutbeam, 2007). This further ensures that patients are fully informed, retain control and contribute to care delivery (Seah et al., 2022; Wise & Nutbeam, 2007). Finally, re-orientating health care also enhances the delivery of care that is respectful of patient's values and preferences (Summit et al., 2003; Wise & Nutbeam, 2007). This research programme will contribute to improving the health of pwCVD in the Cameroonian context by improving the capacity of the physiotherapists to deliver on HP. The recommendations may improve the quality of the HP interventions delivered to pwCVD, thereby increasing their capacity to control and improve their health amidst the limited healthcare capacity.

As part of the Ottawa Charter, seven prerequisites for health were also outlined: *peace, shelter, education, food, income, a stable ecosystem, and sustainable resources.* Health for all by the year 2000 has not been achieved due to the lack or absence of these prerequisites (Bryant et al., 1991; Gunning-Schepers, 1986). These prerequisites are closely related to determinants of health outside an individuals' control (Oakes, 2008).

3.2.2 Prevention of Diseases

A preventive program is often administered to healthy people in the general population to prevent disease before it develops. For an effective prevention intervention, understanding the natural history, distribution of the condition, and how to identify new cases are valuable. Also, it entails establishing a good course of action to respond to an event or condition that may or may not have happened. For every clinical case, there are likely to be many pre-clinical cases in the community ("iceberg of disease") with more exposure to the risk factors for a condition (*AFMC Primer on Population Health*, n.d.).

For convenience, disease prevention can be described as four distinct phases along the natural history of diseases, though in reality, they blend into each other (see Table 3).

Table 3. Etiological and clinical phases of disease prevention.

ETIOLOGICAL PHASE		CLINICAL PHASE	
Social and environmental determinants	Risk and protective factors	Pre-clinical phase	Post clinical phase
Primordial Prevention	Primary Prevention	Secondary Prevention	Tertiary Prevention
Modifying determinants of health	Changes in the exposures that lead to disease	Identify and treat pathological processes at an earlier stage when treatment is more likely to be effective.	Rehabilitation and follow-up care prevent relapses and further deterioration.

The following section highlights the different phases at which prevention of diseases and potential case can receive support to increase control over or improve on their health.

3.2.2.1 Primordial Prevention

Primordial prevention involves minimising future dangers to health and thereby reducing the establishment factors (environmental, economic, social, behavioural, cultural) that increase disease risk (Gillman, 2015). Primordial prevention addresses broad health determinants rather than risk factors that affect individuals with CVD, for example, promoting environments that encourage exercise and physical activity, implementing policies to reduce trans fats in food consumption, and educating children about healthy eating habits to prevent obesity and high blood pressure from developing (Ferdinand, 2019). Although primordial prevention is conceptually related to population health, clinicians can play a role in bringing problems to light and advocating for action (Turco et al., 2018).

3.2.2.2 Primary Prevention

A primary prevention strategy aims to prevent specific diseases by reducing their risks by altering behaviours and exposures that can lead to disease or improving resistance to exposure to disease agents, such as smoking cessation, regular exercise and balanced nutrition. Some approaches include active participation, while others are passive, for example, regular exercise to improve joint health and prevent osteoarthritis and educational campaigns about the dangers of smoking or excessive alcohol consumption (Chiodini & Bolland, 2018; Stokes, 2015). Promoting healthy behaviours is one approach

used to improve resistance and safe environments for disease risk reduction (*AFMC Primer on Population Health*, n.d.).

3.2.2.3 Secondary Prevention

Secondary prevention strategy involves detecting and treating pre-clinical pathological changes to control the progression of a disease (Dennis, 2016). Early screenings and interventions are more cost-effective than intervening once symptoms appear since they lead to earlier treatment. For instance, testing for blood sugar regularly in people over 40 to detect diabetes early. Screening is usually conducted by health professionals, either individually, through routine blood pressure checks or through public health screening programs with mass mammography screening (Becerra et al., 2015; Winnige et al., 2021).

3.2.2.4 Tertiary Prevention

Tertiary prevention aims to reduce the impact of disease on the patient's quality of life, longevity, and function, for example, cardiac rehabilitation following a major cardiovascular event, with the aim to alter behaviour and reduce the risk of recurrence (Bozkurt et al., 2021). Tertiary prevention includes modifying risk factors, such as losing weight for cardiac patients or reducing allergen exposure for asthmatic patients. In cases of irreversible conditions, tertiary prevention involves helping the patient adapt to their disability through rehabilitation (Kamiya et al., 2020). The prevalence of reversible conditions, such as heart disease, may be reduced by tertiary prevention, whereas the prevalence of incurable conditions may increase if it prolongs survival. A key goal of tertiary prevention is to improve quality of life (*AFMC Primer on Population Health*, n.d.). For example, improving the exercise capacity of heart failure patients to increase independent function and quality of life (Zhuang et al., 2021).

3.2.3 Health Protection

Health protection refers to strategies aimed at minimising the risk and impact of a condition by combining preventive measures, risk factor management, and equitable access to healthcare resources (Martin et al., 2024). Health protection emphasises reducing modifiable risk factors such as hypertension, obesity, smoking, poor nutrition, and physical inactivity. Evidence-based strategies like community interventions for sodium reduction, promoting physical activity, and dietary improvements are critical in decreasing the incidence of CVD (Martin et al., 2024). Addressing social determinants of health is central to health protection and includes access to healthcare for underserved populations, enhancing community-based programs, and using culturally tailored

approaches to tackle health disparities among marginalised groups (Coronado et al., 2022) . Promoting early screening for conditions like high blood pressure and cholesterol is central to health protection. Currently, it is challenging to describe to what extent this is applicable to CVD in Cameroon, especially from a policy and physiotherapy perspective (Tatah et al., 2021)

3.3 Evidence of Lifestyle Intervention Used in Disease Prevention

There is overwhelming evidence to support the use of lifestyle interventions for the prevention and management of chronic and lifestyle diseases (Hayba et al., 2018; Hirashiki et al., 2022; Sagastume et al., 2022). Several recent systematic reviews demonstrating the effectiveness of lifestyle interventions have been published, including managing excessive weight gain in young adults of diverse backgrounds (Hayba et al., 2018) and preventing NCDs in Japan and other Asian countries (Hirashiki et al., 2022). In one systematic review and meta-analysis, Sagastume and colleagues demonstrated that comprehensive lifestyle interventions are effective in preventing type 2 diabetes among at-risk populations in low-medium-income countries (Sagastume et al., 2022).

Ford and colleagues, in a landmark study, demonstrated risk reduction for chronic conditions (cardiovascular disease, diabetes, and cancer) among Germans (Ford et al., 2009). With over 23000 participants over an average follow-up period of 7.8 years, they demonstrated the benefits of 4 healthy lifestyle factors (not smoking, maintaining a normal body weight, staying physically active and adopting a healthy diet (high intake of fruits, vegetables, and whole-grain bread and low meat consumption)) on reducing the risk of NCDs. Participants with all four factors at baseline showed a 93% risk reduction in the incidence of type 2 diabetes, 81% for myocardial infarction, 50% for stroke and other cancers reduced by 36%. There was a relation between the number of positive lifestyle factors individuals adhere to and the risk of developing chronic lifestyle-related NCDs, even if not all four lifestyle behaviours are present (Ford et al., 2009). Furthermore, Blanchard and colleagues demonstrated the benefits of lifestyle intervention among cancer survivors despite significant improvements in the health-related quality of life with additional positive lifestyle behaviour (Blanchard et al., 2008; Cai et al., 2008). However, they reported that potentially terminal diagnoses seem not to confer sufficient motivation for adherence to lifestyle recommendations (Blanchard et al., 2008). For patients and clients to sustain healthy lifestyles, lifestyle behaviour change must be systematically assessed, and a targeted intervention should be developed.

The specific characteristics of lifestyle interventions delivered by physiotherapists for pwCVD remains unclear. The following systematic scoping review examined PLHP strategies for pwCVD and evaluated the extent to which physiotherapists utilised behaviour change theories and models.

3.4 Published Article (Study 1)

The Scoping review findings were accepted on November 8, 2023, and subsequently published in the peer-reviewed *International Journal of Environmental Research and Public Health* on November 16, 2023. Since its publication, the article has been viewed 3535 times (as of December 3, 2024) and is widely shared on social media, with Google Scholar indicating five citations. Study 1 is reproduced here, with the publisher's permission, in the format that it was published online.

3.4.1 Erratum: Physiotherapy-Led Health Promotion Strategies for People with or at Risk of Cardiovascular Diseases: A Scoping Review

In the published version presented here, the total number of records before screening was incorrectly stated as 4,992, rather than the correct figure of 4,381 shown in the PRISMA flowchart.

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MDPI

Review

Physiotherapy-Led Health Promotion Strategies for People with or at Risk of Cardiovascular Diseases: A Scoping Review

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Abstract: Cardiovascular diseases (CVD) are prevalent and lead to high morbidity and mortality globally. Physiotherapists regularly interact with patients with or at risk of CVDs (pwCVDs). This study aimed to assess the nature of existing evidence, interventional approaches used, and the population groups included in physiotherapy-led health promotion (PLHP) for pwCVDs. The scoping review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines. Medline, PubMed, Web of Science, Cochrane Central Register of Controlled Trials, CINAHL, and PEDro databases were searched from inception until June 2023. Two reviewers independently screened the titles, abstracts, and full text and conducted data extraction. All conflicts were resolved with a third reviewer. A total of 4992 records were identified, of which 20 full-text articles were included in the review. The studies had varied populations, including those with stroke, coronary artery diseases, peripheral artery diseases, hypertension, diabetes, and multiple CVD risk factors. The interventions ranged from exercise and physical activity programmes, dietary interventions, education, and counselling sessions with various supplementary approaches. Most interventions were short-term, with less than 12 months of follow-up. Interventions were personalised and patient-centred to promote adherence and health behaviour change. Among the included studies, 60% employed experimental designs, with the remainder using quasi-experimental designs. Although a wide range of PLHP strategies have been used for pwCVDs, exercise and physical activity were employed in 85% of the included studies. Other components of health promotion, such as sleep, smoking, and alcohol abuse, should be investigated within PLHP.

Keywords: physiotherapy; health promotion; cardiovascular diseases; risk factors; interventions

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1. Introduction

Cardiovascular disease (CVD) includes all diseases that affect the cardiovascular system (the heart and blood vessels). CVD is the leading cause of disability and mortality globally [1] and accounts for the highest proportion (44%) of chronic non-communicable disease deaths annually [2] and 32% of all deaths globally [3,4]. CVDs are associated with severe social consequences, including reduced quality of life and economic growth, and consume many health service resources in developing and developed countries [5,6].

Annually, approximately 15 million people globally suffer a stroke [7], estimated to rise to 77 million by 2030 [8]. The cumulative risk of stroke recurrence at five years is 1.3%, and at ten years is 39.2% [9], with a higher death and disability rate associated with recurrent stroke [10]. Chronic non-communicable diseases are associated with multiple risk factors, including genetic and environmental factors, metabolic factors (hypertension, diabetes, abnormal lipids, obesity), and behavioural factors (tobacco use, unhealthy diet, physical inactivity) [11]. These risk factors are drivers of the global CVD epidemic [6,12]. A global study in 52 countries identified similar risk factors for heart diseases in low- and

high-income countries [12]. However, over three-quarters of the global burden of CVD is from low- and middle-income countries (LMICs), with a rising incidence [13,14].

The effectiveness of lifestyle changes and physical interventions is well established in the primary, secondary, and tertiary prevention of CVDs [15,16]. Primary prevention aims to reduce the incidence of an index cardiovascular event, especially in at-risk people [11,17]. Secondary and tertiary prevention programmes are often provided at specialised cardiac rehabilitation centres and directed towards reducing the recurrence of cardiac events, restoring patients' quality of life, improving functional capacity, stress, and self-management techniques, and promoting a healthy lifestyle [18]. There is evidence that cardiovascular mortality can be reduced and signs and symptoms of established CVD improved by addressing behavioural risk factors such as an unhealthy diet [19], physical inactivity [20], harmful use of alcohol [21], tobacco use [22], inadequate sleep [23], and poor stress management [3,24,25]. Adopting these preventive strategies may reduce the incidence of heart disease [26,27].

Physiotherapists play a role in reducing risk and managing patients at risk or with established CVD (pwCVDs) [28–30]. Despite the substantial burden of CVDs and the evidence supporting cardiac rehabilitation in preventing and managing CVDs, many LMICs do not have existing structures and programmes promoting the prevention and rehabilitation of pwCVDs [18,31,32]. Cardiac rehabilitation services are available in 80% of European countries, but only 17% of African countries [31]. It is therefore important to scale up rehabilitation for pwCVDs in accordance with the WHO call for action "Rehabilitation 20230 [33]. Cardiac rehabilitation services are rare in LMICs for several reasons, including lack of personnel resources, competing priorities, affordability issues, and insurance coverage [32]. Physiotherapists in LMIC settings receive pwCVDs in their practice, providing an opportunity to provide cardiac rehabilitation-related interventions through health prevention and promotion. The contact time and frequent visits make them well-placed to provide physiotherapy-led health promotion (PLHP). PLHP refers to the approach within the field of physiotherapy that focuses on promoting overall health and well-being through education, lifestyle modification, and preventive strategies beyond acute care [34]. Both promotive and preventive strategies, such as health education and the use of exercise in disease prevention and management, are at the core of physiotherapy practice. Given the rising incidence of CVDs and the lack of cardiac rehabilitation services in LMICs, it is essential that physiotherapists from these countries are able to deliver health promotion strategies effectively given the lack of advanced treatment opportunities for these patients. However, no evidence exists to inform or enhance PLHP practice globally.

Previous reviews on PLHP are limited and focused on health education strategies for lifestyle-related conditions in general [35], promoting physical activities [28,36], entry-level training and physical activity promotion [36], and physical activity in cystic fibrosis patients [37]. There are no reviews investigating PLHP strategies for pwCVDs. Consequently, a review is warranted to systematically scope and map out the existing evidence in this area. This review summarises the available literature with the following objectives:

- To assess the characteristics of existing evidence on PLHP for pwCVDs globally.
- To identify the interventional approaches that have been used in PLHP strategies for pwCVDs.
- To evaluate the type of population groups included in the PLHP research.

2. Methodology

A scoping review was used to identify and synthesise data on PHLP strategies and interventions in the literature and map existing evidence's characteristics without critically appraising the methodological quality [38,39]. The methodological framework published by Arksey and O'Malley and the methodological advancement by Levac and colleagues were adopted for this study [40,41]. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR) recommendations were used for reporting this systematic scoping review [42,43]. The proposed stages in this

framework are: (1) Identifying the research questions, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarising and reporting [41]. The template for intervention description and replication (TIDieR) framework was used to extract intervention data from the included studies. The study protocol was registered on the Open Science Frame (OSF) (OSF.IO/BFZ6Y). This review involved no direct contact with patients or healthcare professionals but reviewed and synthesised already-published data, and therefore was not subject to ethical approval.

2.1. Identifying the Research Question

Scoping review questions are generally broad and aim to summarise the available evidence of interest [43]. Based on the overall project aims, the following questions were identified for the present study: (1) What are the characteristics of existing evidence of PLHP for pwCVDs globally? (2) What interventional approaches have been used in PLHP strategies for pwCVDs globally? (3) What population groups have been included in the PLHP research globally?

2.2. Identifying Relevant Studies (Database and Search Strategy)

The following electronic databases, registries, and search engines were searched for eligible articles from the inception of the database to June 2023: MEDLINE, PubMed Web of Science, Cochrane Central Register of Controlled Trials, EMBASE, CINAHL, PEDro, Google Scholar, the EU clinical trial register, African Index Medicus, World Physiotherapy Conference proceedings, trials registries, and the World Health Organisation International Clinical Trials Registry Platform portal. A search strategy that considered relevant index terms and keywords was developed with assistance from an experienced librarian from Sheffield Hallam University (Table 1). A subject librarian at Sheffield Hallam University further reviewed this. The search strategy for MEDLINE (final) was adapted for searches in other included databases. Search filters such as publication in the English language, human species, and primary studies were used in relevant databases. References to identified previous and adjacent reviews and included papers were also screened. A complete MEDLINE search strategy can be found in Appendix A.

Table 1. Search Parameters.

Participants/Population	Concept/Intervention
Cardiovascular disease and risk factors block keywords, cardiovascular diseases, heart diseases, coronary artery disease, coronary heart disease, myocardial infarction, heart failure, angina, cerebrovascular disease, stroke patients, and aortic atherosclerosis patients—overweight, obesity, diabetes, blood pressure, hypertension, dyslipidaemia.	Physiotherapy block keywords: Physiotherapist(s), physiotherapy, kinesiotherapy, physical therapist(s), physiotherapy assistant. Health promotion block keywords: Patient education, health promotion, health education, health behaviour, educational technology, diet therapy, educational health promotion, group-based, individual, home and hospital-based approaches, lifestyle modification, lifestyle change recommendations, physical activity and exercise promotion, brief counselling, face to face, group sessions, skill training, visual presentation, handouts, brochures and diaries, motivational prompts, individualised plan, goal setting, nutrition and weight management, smoking cessation, tobacco exposure, sleep, stress management.

2.3. Eligibility Criteria

Studies were included if they reported or evaluated health promotion for pwCVDs, were led by physiotherapists, and were published in English. Studies with a focus on specific clinical or therapeutic outcomes rather than health promotion were excluded. Details on inclusion and exclusion criteria are provided in Table 2.

Table 2. Inclusion and exclusion criteria.

Participants/Population	Concept/Intervention	Context	Study Types and Design
Inclusion Criteria			
• Patients with CVD risk factors or established CVDs. • Studies conducted or implemented by Physiotherapists or Physiotherapy assistants.	• Health promotion strategies, including behavioural change, educational, client-centred societal change, etc.	• Primary, secondary, and tertiary care settings. • Rural and urban settings. • Low- and high-income countries.	• All eligible primary studies. • Both quantitative and qualitative studies published and unpublished articles.
Exclusion Criteria			
Studies on pwCVD with relevant outcomes were initiated and implemented by clinicians other than physiotherapists.	• Studies on pwCVD but with non-cardiovascular related outcomes. • Pure therapeutic intervention with no intention to improve adherence or health behaviours.		• (Incomplete research data. • letters to the editor, commentaries, notes, reviews. • studies in languages other than English. • Secondary research with any design will be excluded.

2.4. Study Selection (Screening)

Studies identified through searches were imported to Covidence, and duplicates were removed. Two independent reviewers (ENN, CG) individually screened studies using a three-step process: First titles, then abstracts (Cohen's kappa score = 0.43), and finally, full text was screened based on the inclusion and exclusion criteria (Table 2). The full texts of selected studies were reviewed in detail against the inclusion criteria by two independent reviewers (Cohen's kappa score = 0.35) (ENN, SM). All reasons for excluding potential studies that did not meet the inclusion criteria are reported on the PRISMA flowchart. Any disagreements between the reviewers at each stage of the study selection process were resolved through discussion, and where an agreement was not met, a third reviewer (AL) was consulted.

2.5. Data Charting (Data Extraction)

Data charting is the method for extracting data for scoping reviews [40,42]. The chart included information about study participants and the design. Data about the nature of the intervention(s) were extracted based on the TIDieR framework, including the theoretical framework (why), intervention type (what), intervention duration (when), intervention provider (who), delivery format (how), intervention location (where), number of intervention sessions (how much), personalised intervention (tailoring), and fidelity (how well). Intervention duration of less than 12 months was described as short and more than 12 months as long. Total intervention sessions less than 15 sessions and 16 sessions and above were described as low and high volume, respectively. In cases of missing data or insufficiently described processes, the corresponding authors were contacted to clarify or provide the missing information. Screening and data extraction were completed in Covidence.

2.6. Quality Appraisal

Based on current guidance for conducting scoping reviews, quality appraisal was not considered necessary to achieve the aims of this study [40,43].

2.7. Consultation

We consulted relevant stakeholders, experts in the field, and key informants in the later stages of this review to clarify missing information, identify relevant studies that are ongoing, or identify interventions/concepts not considered in the review [44].

2.8. Collating, Summarising, and Reporting

Results are synthesised narratively and presented in a table format based on elements of the TIDier framework.

3. Results

3.1. Literature Search and Included Studies

The PRISMA flow chart (Figure 1) summarises search results and the methodological steps to arrive at the included studies. The search yielded 4381 articles with the respective numbers for each database, as shown on the PRISMA flow chart (Figure 1). After removing the duplicates, 1716 studies remained and were screened for eligibility. After screening titles and abstracts, 227 articles were deemed potentially eligible. Following full-text screening, 20 studies were included in this review. Reasons for exclusions are documented on the PRISMA flow chart.

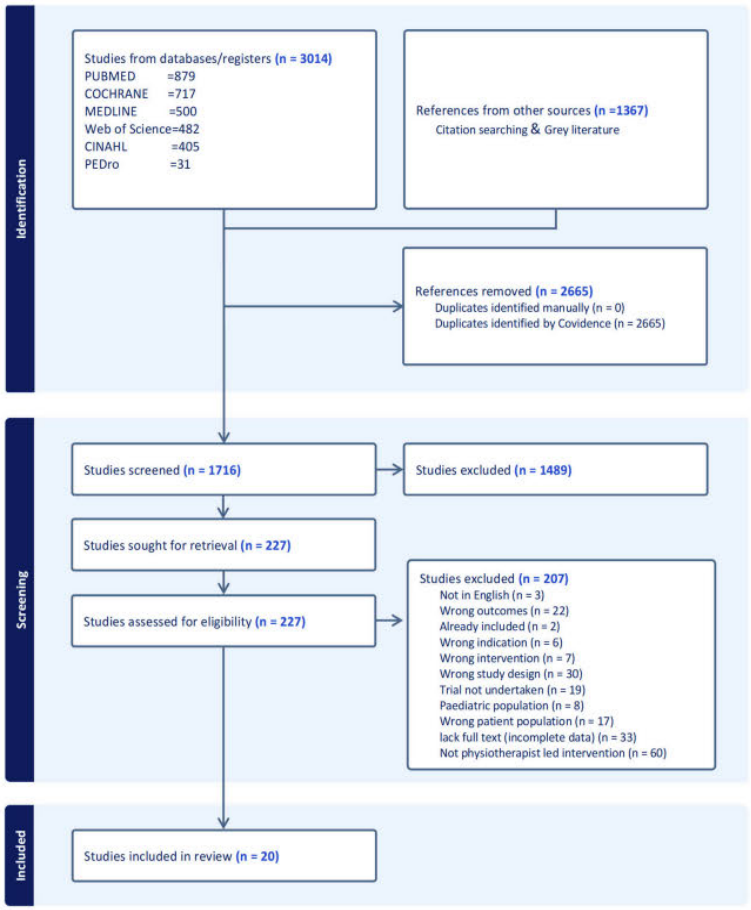

Figure 1. PRISMA flow chart for searches.

3.2. Characteristics of Included Studies

Table 3 summarises the characteristics of the included studies. Of the twenty included studies, 12 were randomised controlled trials (RCTs) [45–56], seven were quasi-experimental studies [57–63], and one was a secondary analysis of trial data. All included studies were published between 2002 and 2022. Thirty percent of the included studies were

published between 2016 and 2020 [55,57–59,64,65]. Studies were conducted on patients with stroke (n = 4) [53,57–59], risk factors for CVD (n = 4) [47,50,54,62], coronary heart diseases (n = 3) [51,52,63], peripheral arterial diseases (n = 2) [45,56], diabetes (n = 3) [48,52,60], weight/obesity (n = 2) [49,61], and hypertension (n = 2) [46,55]. The sample size of the included studies ranged from 18 to 882 participants [45,46]. The included studies were conducted in 15 countries, with England [56,61], Australia [45,57], Spain [46,63], The Netherlands [48,49], and Norway [58,64] having two studies each and the remaining countries having one study each (Table 4). The majority of studies were from high-income countries (HICs), with 47% from Europe alone, and only two publications [54,55] from two LMICs (Brazil and China). No studies were identified from the African continent.

3.3. Characteristics of the Included Interventions

All studies were either solely implemented by physiotherapists (n=13) [45,46,48,50,52–59,61] or in combination with other healthcare professionals (nurses, physicians, and dieticians/nutritionists), with physiotherapists leading defined components of the intervention (n = 7) [47,49,54,60,62,63,65]. The identified interventions were heterogeneous and reported according to the TIDieR framework in Table 4. 85% of studies used multimodal intervention strategies, with only 15% of studies using a single intervention strategy [46,51,56]. Seven (35%) of the 20 publications employed behaviour change approaches and psychological models such as the theory of planned behaviour and the common-sense model of illness representations (n = 1) [56], health belief model and transtheoretical model to promote participant exercise behaviours (n = 1) [50], Bandura's self-efficacy theory (n = 1) [63], and motivational interviewing (n = 4) [51,56,58,62]. The majority of interventions included exercise or physical activity (n = 18), education on lifestyle (n = 2) [52,59], and dietary education in combination with another physiotherapists' led intervention (n = 6) [47,49,50,52,55,63]. Seven studies employed behaviour change programmes focused on physical activity uptake (n = 5) [51,56,57,61,63] and diabetes management (n = 2) [55,60] with only two underpinned by behaviour change theory [56,63]. Self-management and home programmes were also identified (n = 4) [48,52,57,62]. Individualised coaching on physical activity and exercise (n = 5) [49,58,60,62,64] and use of the health improvement card (HIC) (n = 1) [54] were also used by physiotherapists to enhance activity and reduce cardiovascular risks, with only two studies (n = 2) reporting employing behavioural change techniques [62,64]. Six studies were characterised by the provision of educational materials/resources, including brochures on healthy lifestyle practices and lifestyle behaviour change (n = 2) [45,54], written instructions and recommendations (n = 2) [47,59], workbooks (n = 1) [55], and handouts following each session (n = 1) [61]. Technology-based strategies were also used to deliver interventions for weight management (video-conferencing sessions with real-time communications and the use of remote monitoring using Fitbit) (n = 1) [60], video/television programme called Sit and Be Fit during the exercise phase (n = 1) [62], and videos on specific exercises and techniques (n = 1) [50]). Six studies were supplemented by telephone calls (n = 6) [48,50–52,56,58]. Adherence to interventions was reported in nine studies [49,50,56–60,62,63].

Table 3. Components and characteristics of the interventions in the included studies for pwCVDs.

	Overall Aim of Intervention	Education on Lifestyle	Dietary Education and Physiotherapy	Exercise and/or Physical Activity	Self-Management and Home Programmes	Behaviour Change Programmes on Physical Activity Uptake	Individualised Coaching on Physical Activity and Exercise	Health Improvement Card (HIC)	Provision of Educational Materials/Resources Such as Brochures on Healthy Lifestyle Practices and Lifestyle Behaviour Change	Workbook	Written Instructions and Recommendations	Handouts Following Each Session	Technology Based	Theory-Based Intervention	Supplemented by Telephone Calls
Fowler et al., 2002 [45]	Improving maximum walking distance in early peripheral arterial disease			✓					✓		✓				
Bonet et al., 2003 [46]	Evaluate, in women with grade 1 essential hypertension, the response of cardio-respiratory and blood pressure after 6 weeks of supervised physical exercise vs. only recommended exercise			✓							✓				
Eriksson et al., 2006 [47]	Lifestyle intervention programme in primary healthcare		✓	✓					✓						
Quinn et al., 2008 [61]	The effect of a physical activity group-based education programme on weight reduction, physical activity, cardiovascular fitness, quality of life	✓		✓		✓						✓	✓		
Pariser et al., 2010 [60]	Active Steps for Diabetes			✓		✓	✓				✓				
Wisse et al., 2010 [48]	Assess the impact of personalized exercise prescription on habitual physical activity and glycemic control in sedentary, insulin treated type 2 diabetes patients			✓	✓						✓	✓			✓
Molenaar et al., 2010 [49]	Nutritional counselling and nutritional plus exercise counselling in overweight adults		✓	✓			✓								✓
Wu et al., 2011 [50]	Evaluate short- and long-term effects of home-based exercise on adiponectin, exercise behaviour and metabolic risk factors in middle-aged adults at diabetic risk		✓	✓										✓	
Reid et al., 2012 [51]	Evaluate long-term physical activity levels between a theoretically guided motivational counselling (MC) intervention group and a usual care	✓		✓		✓							✓	✓	✓

Table 3. *Cont.*

	Overall Aim of Intervention	Education on Lifestyle	Dietary Education and Physiotherapy	Exercise and/or Physical Activity	Self-Management and Home Programmes	Behaviour Change Programmes on Physical Activity Uptake	Individualised Coaching on Physical Activity and Exercise	Health Improvement Card (HIC)	Provision of Educational Materials/Resources Such as Brochures on Healthy Lifestyle Practices and Lifestyle Behaviour Change	Workbook	Written Instructions and Recommendations	Handouts Following Each Session	Technology Based	Theory-Based Intervention	Supplemented by Telephone Calls
Oerkild et al., 2012 [52]	Home-based cardiac rehabilitation	✓	✓		✓										✓
Takatori et al., 2012 [53]	Investigate the effect of intensive rehabilitation on physical and arterial function among community-dwelling stroke survivors	✓		✓											
Preston et al., 2016 [57]	Improving self-management				✓	✓									
Higgs et al., 2016 [59]	Acceptability of a community-based lifestyle programme for adults with diabetes/prediabetes	✓		✓			✓								
Gunnes et al., 2018 [58]	To investigate adherence to an 18-month physical activity and exercise programme			✓			✓							✓	✓
Gunnes et al., 2019 [64]	To assess the associations between participants' degree of adherence to physical activity and exercise and motor function 18 months after inclusion	✓		✓			✓								
Bai et al., 2020 [54]	Health improvement card (HIC) on lifestyle practices and biometric variables in community-dwelling Chinese participants			✓				✓	✓						
Gerage et al., 2020 [55]	To investigate the efficacy of a behaviour change programme on cardiovascular parameters in hypertensive patients		✓	✓		✓				✓					
Batsis et al., 2021 [62]	Technology-based weight management intervention for rural older adults with obesity			✓			✓					✓		✓	

Table 3. *Cont.*

	Overall Aim of Intervention	Education on Lifestyle	Dietary Education and Physiotherapy	Exercise and/or Physical Activity	Self-Management and Home Programmes	Behaviour Change Programmes on Physical Activity Uptake	Individualised Coaching on Physical Activity and Exercise	Health Improvement Card (HIC)	Provision of Educational Materials/Resources Such as Brochures on Healthy Lifestyle Practices and Lifestyle Behaviour Change	Workbook	Written Instructions and Recommendations	Handouts Following Each Session	Technology Based	Theory-Based Intervention	Supplemented by Telephone Calls
Bearne et al., 2022 [56]	The effect of a home-based, walking exercise behaviour change intervention in adults with peripheral arterial disease and intermittent claudication			✓		✓									✓
Deka et al., 2022 [63]	The effectiveness of a dietary-education and high-intensity interval resistance training programme on healthy food choices and associated anthropometric variables		✓	✓		✓								✓	

✓: Match the corresponding components and characteristics of the interventions with respective studies.

Table 4. TIDIER components and the nature of PLHP interventions for pwCVDs of the included studies.

Author Year	Country	N	Study Design	Population	Nature of the Intervention	Intervention Duration	Theory Use	Mode of, and Delivered by	Setting(s)	Educational Component	Delivery Format	Number of Sessions	Technology	Tailoring	Fidelity
Fowler et al., 2002 [45]	Australia	882	RCT	Males aged 65 to 79 years with PAD	Individual and community intervention, advised participants to walk >30 min daily	Short (12 months)	No	Educational materials and f-t-f by PT	Combined	Yes	Combined	High	No	Yes	No
Bone et al., 2003 [46]	Spain	18	RCT	Overweight women of 30–50 years with grade 1 hypertension	Supervised physical exercise	Short (6 months)	No	Educational materials and f-t-f by PT	Combined	No	Group	High	No	Yes	No
Eriksson et al., 2006 [47]	Sweden	151	Randomised controlled parallel group trial	Patients diagnosed with hypertension, dyslipidaemia, type 2 diabetes, obesity, or any combination thereof are aged 18–65	Lifestyle intervention in primary healthcare	Short (3 months)	No	f-t-f by PT and assistants, dietician and a physician	Clinic	Yes	Group	High	No	Yes	No

Table 4. *Cont.*

Author Year	Country	N	Study Design	Population	Nature of the Intervention	Intervention Duration	Theory Use	Mode of, and Delivered by	Setting(s)	Educational Component	Delivery Format	Number of Sessions	Technology	Tailoring	Fidelity
Quinn et al., 2007 [61]	Ireland	18	Pre-post-test design	Obese females	Physical activity education	Short (4 months)	No	f-t-f by PT	Clinic	Yes	Individual	Low	No	No	No
Pariser et al., 2010 [60]	USA	22	Pre-post-test design	Type 2 Diabetes patients with impaired mobility issues	Active steps for diabetes (exercise and educational intervention)	Short (2 months)	No	f-t-f by PT (assisted by PT student or nurse/diabetes educator)	Combined	No	Combined	High	Yes	Yes	No
Wisse et al., 2010 [48]	The Nether-lands	74	RCT	Sedentary, insulin-treated type 2 diabetes	Regular, structured, and personalised exercise prescription	Long (24 months)	No	f-t-f by PT supplemented with telephone calls	Combined	Yes	Individual	Low	Yes	Yes	No
Molenaar et al., 2010 [49]	The Nether-lands	203	RCT	Men and non-pregnant women aged 18–65 years with a BMI of 28–35 kg/m^2	Nutritional counselling and nutritional plus exercise counselling in overweight adults.	long (13.7 months)	No	f-t-f by Dietician and PT	Clinic	Yes	Individual	Low	No	Yes	Yes
Wu et al., 2011 [50]	Taiwan	135	RCT	People 45 to 64 years old are at risk of developing diabetes	Home-based exercise	Short (6 months)	Yes	f-t-f supplemented with telephone calls by PT	Community	Yes	Individual	High	Yes	Yes	Yes
Reid et al., 2011 [51]	Canada	141	RCT	Patients with acute coronary syndromes	Motivational counselling intervention	Short (12 months)	Yes	f-t-f supplemented by telephone calls	Combined	Yes	Individual	Low	Yes	Yes	Yes
Oerkild et al., 2012 [52]	Denmark	40	RCT	Elderly coronary heart disease above 65 years	Cardiac home programme for the elderly	Short (12 months)	No	home visits in person, follow-up with telephone calls by PT	Community	Yes	Individual	Low	Yes	Yes	No
Takatori et al., 2012 [53]	Japan	44	RCT	Chronic stroke survivors 57–89 years	Exercise therapy	Short (3 months)	No	f-t-f by PT	Clinic	No	Individual	High	No	Yes	No
Higgs et al., 2016 [59]	New Zealand	36	Prospective observa-tional	Diabetic or at a high risk of developing diabetes	Education and exercise	Short (3 months)	No	f-t-f by PT, PT students and a nurse.	Clinic	Yes	Individual	High	No	Yes	Yes
Preston et al., 2017 [57]	Australia	20	pre-post-test interven-tion	Patients with mild to moderate acute stroke	Self-management	Short (3 months)	No	f-t-f by PT	Community	Yes	Individual	Low	No	Yes	Yes
Gunnes et al., 2018 [58]	Norway	186	Prospective longitudi-nal	Adult stroke patients	Physical activity and exercise programme	Long (18 months)	Yes (MI)	f-t-f and over the phone by PT	Community	Yes	Individual	High	Yes	Yes	Yes
Gunnes et al., 2019 [64]	Norway	186	Secondary analyses of multisite RCT	Stroke patients	Individualised coaching on physical activity and exercise	Long (18 months)	Yes (MI)	f-t-f supplemented by telephone calls by PT	Clinic	Yes	Individual	High	Yes	Yes	Yes

Table 4. *Cont.*

Author Year	Country	N	Study Design	Population	Nature of the Intervention	Intervention Duration	Theory Use	Mode of, and Delivered by	Setting(s)	Educational Component	Delivery Format	Number of Sessions	Technology	Tailoring	Fidelity
Bai et al., 2020 [54]	China	200	RCT	50–90 years	Health education based on the HIC, individualised exercise programme. Standard brochure on healthy lifestyle practices	Short (3 months)	Yes (HIC)	f-t-f by PT students supervised by PT.	Community	Yes	Individual	Low	No	Yes	No
Gerage et al., 2020 [55]	Brazil	90	RCT	Patients with primary hypertension	Behavioural change programme supplemented with educational materials	Short (3 months)	Yes (VAMOS)	f-t-f by PT	Clinic	Yes	Group	Low	No	No	No
Batsis et al., 2021 [62]	USA	54	Single-arm trial	Older (65+) adults with obesity (BMI > 30 kg/m^2) residing in rural New Hampshire and Vermont	Technology-based weight management intervention	Short (6 months)	Yes (social cognitive theory, MI)	f-t-f and telemedicine (video conferencing, remote use of Fitbit) and periodic face-to-face interaction onsite. By dietitian and PT	Community	Yes	Combined	High	Yes	Yes	Yes
Bearne et al., 2022 [56]	England	190	RCT	Adults with peripheral arterial disease and intermittent claudication	Walking Exercise Behaviour Change Intervention	Short (6 months)	Yes (theory of planned behaviour and the common sense model of illness representation)	f-t-f and supplemented by telephone calls by PT	Clinic	Yes	Individual	Low	Yes	Yes	Yes
Deka et al., 2022 [63]	Spain	22	Single-arm trial	Patients with coronary artery diseases	Dietary education and a high-intensity interval resistance training programme (DE-HIIRT)	Short (3 months)	Yes (Bandura' self-efficacy theory)	f-t-f by dietician and PT	Clinic	Yes	Combined	22	No	Yes	Yes

PAD: peripheral arterial diseases, f-t-f: face-to-face, PT: physiotherapist, short: <12 months, long: >13 months, high = 16 sessions, low = <15 sessions, HIC: health improvement card, MI: motivational interviewing, VAMOS: Vida Ativa Melhorando a Saúde, BMI: body mass index, RCT: randomised controlled trial, USA: United States of America.

4. Discussion

This review identified the nature of the evidence and the types of interventions used and implemented by physiotherapists for pwCVDs within their scope of practice. This involved opportunistic advice, discussions, encouragement, and strategies that physiotherapists are able to use for disease prevention and health promotion within their profession in addition to their therapeutic role. While health promotion and therapeutic interventions are within the scope of physiotherapy practice, much attention has not been given to physiotherapy health promotion globally. This is the first review explicitly exploring PLHP for pwCVDs globally, providing an opportunity for discussion and future research in this area.

No grey literature was found, and all included studies were published between 2002 and 2022. Given that there were no restrictions in the search period, this is a small volume of literature. This could be explained in two ways. Firstly, the inclusion was based on physiotherapists leading or implementing the intervention, focusing on primary and secondary prevention of CVDs to heart disease risk factors. Based on this criterion, many studies were excluded as not physiotherapist led (n = 60) (Figure 1). Secondly, earlier attention to physiotherapists' interventions was directed towards therapeutic and curative treatment rather than prevention. Over the last two decades, physiotherapy preventive roles have been increasing with the rising burden of CVDS [65,66]. This aligns with the global call for physiotherapists to contribute to preventing lifestyle-related conditions [65–67]. The increasing trend in research output indicates that more evidence will emerge in the coming years as physiotherapists gain skills and autonomy in leading prevention programmes.

Currently, most studies have emerged from Europe (55%), with no studies from the African continent. Given the vast burden of CVDs in African countries with unique ethnic, cultural, and context-specific determinants [68,69] and the lack of CR programmes on this continent [31,70], it is essential to see more research investigating PLHP for pwCVDs in African countries to facilitate effective preventive interventions. Only two studies (10%) from LMICs were included in this review, and both were supported with research funding [54,55]. Generally, PLHP research may be difficult to realise in LMIC settings due to a lack of research priorities, funding problems, and a lack of infrastructure and researchers with relevant skills [71,72]. Addressing funding issues by budgeting for the prevention of NCDs in LMICs, among other potential barriers, may contribute positively to data generation for pwCVDs in low-resource settings.

Many of the included studies were RCTs (60%), followed by different quasi-experimental designs (35%). The available data provides an opportunity for follow-up studies, such as a systematic review of effectiveness. This is necessary to determine whether PLHPs are effective for wider-scale adoption. No qualitative work on PLHP was identified, and there is a gap in our understanding of patient perceptions and experiences of PLHP approaches. More research is necessary for designing and implementing PLHP in the future.

Diverse interventional approaches have been used in PLHP for pwCVDs (Table 4). CVD PLHP interventions are likely to be complex, and therefore require a multimodal approach, due to different populations, multiple risk factors for CVD, and non-adherence to recommendations for managing these risk factors [66]. This review included studies focused mainly on exercise and physical activity uptake, weight management, and diet. Other components of health promotion for pwCVDs, such as sleep hygiene, smoking cessation, and alcohol abuse, among others, were not reported. These components are within the scope of physiotherapists, and it is necessary that physiotherapists receive adequate training that can enable them to confidently tackle the multiple risk factors associated with CVD. Qualified physiotherapists should be familiar with assessment tools related to general health measures, lifestyle-related behaviours, and NCD risk factors in general, including how to assess self-efficacy for behaviour change and readiness to change a lifestyle behaviour [65,66]. This should include counselling skills and the use of behaviour change strategies for specific populations. Physiotherapists should work in synergy with other health professions, making appropriate referrals and identifying relevant resources to improve outcomes.

Three studies employed theory-based behaviour change models supported by evidence-based behaviour change techniques such as motivational interviewing to inform and complement their interventions. These behaviour change theories and techniques were adopted in more recent studies published between 2011 and 2022. This indicates an increased understanding of the importance of including behaviour change techniques and theories for effective health education to strengthen patients' motivation and adherence during and beyond the active rehabilitation period. More rigorous, theoretically informed approaches to support behaviour change for pwCVDs should be included in intervention strategies that facilitate change in lifestyle risk factors. This is also necessary in clinical practice and should be integrated into physiotherapy training [66]. In delivering broad health promotion strategies for pwCVDs, physiotherapists need to receive broader training in addressing these risk factors.

4.1. Implications for Clinical Practice

It is sensible to consider PLHP strategies incorporating interventions beyond exercise and physical activity. Understanding and increasing competence in implementing behaviour change in stress management, sleep, nutrition, and weight management through appropriate strategies is necessary for effective PLHP. Dean and colleagues highlighted the need to raise the priority of lifestyle prevention strategies for NCDs [67] and competency standards, including relevant behaviour change approaches [66], to improve practice adequately. Considering the different study populations and the multiple risk factors addressed in the included studies, it is necessary that physiotherapists collaborate with other healthcare providers to optimise health promotion and prevention programmes. Digital and technological monitoring and other interventions have been used successfully in some trials and contexts [60,73]. This can be useful in other contexts while considering local challenges and possible barriers.

4.2. Research Implications

The findings of this review demonstrate the lack of studies from Africa and other LMICs, which is concerning given the rising burden of pwCVDs in these regions. For effective interventions to be developed, it is necessary to consider increasing research output in these contexts.

PLHP interventions ought to be multimodal, theoretically informed and supported by behaviour change theories and techniques and delivered by physiotherapists who have been adequately trained and, where necessary, optimised by appropriate health care professionals who complement the physiotherapists' skills and knowledge. These optimised interventions should also be reported in further trials following the TIDier framework. There is no evidence to characterise the optimal intensity and critical characteristics of weight management programmes for specific populations.

Findings highlight the increased use of digital technology at different levels of PLHP interventions with varied levels of adherence [60,62]. Digital or technological devices that are attractive, affordable, easy to use, and sensitive to specific outcomes in different contexts for better adherence and output should be considered.

Most of the included trials reported short-term follow-up. Despite the prevailing challenges, PLHP interventions are warranted to demonstrate longer-term clinical outcomes.

4.3. Strengths and Limitations

Scoping reviews provide breadth and the inclusion of all study designs, which makes this realistic about a topic. This study employed the recommended guidelines for conducting a scoping review with multiple reviewers for data screening and extraction, making the findings rigorous. The broad scope provides a complete overview of PLHP, which has been trialled in primary, secondary, and tertiary health promotion in low- and high-income countries. This provides researchers with clear directions about developing the PLHP based on evidence and where further research needs to be undertaken. Additionally, the results of

this scoping review may apply to clinicians employing the identified strategies/approaches as CVDs and their risk factors share and pose similar risks to other CNCDs. This review considers only literature published in English. This might have limited the scope of this review to articles published in or from non-English-speaking countries.

5. Conclusions

Based on the literature, physiotherapists are trying to address the growing burden of CVDs through various PLHP strategies. PLHP strategies are focused on exercise and physical activity, and there is a need to tackle CVD beyond addressing sedentary behaviour, considering the multiple risk factors. Assessing the risks and needs, tailoring the interventions to individuals, and monitoring appear central and consistent with practical preventive principles and strategies. It is crucial that physiotherapists work together with other healthcare professionals to optimise relevant components of health promotion effectively. Health behaviour change theories and techniques should be commonly used to support positive health behaviour change, and it may be necessary to provide comprehensive training to integrate lifestyle management approaches in physiotherapy practice. This is even more compelling for physiotherapy practice in Africa and LMICs with huge CVD burdens. Further study is needed to elucidate the effectiveness of existing PLHP interventions for pwCVDs. Avenues for future research have been highlighted.

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Appendix A. Medline Search Strings

tiab("physical therapist*" OR "physical therapists" OR kinesiotherapist* OR physiotherapist* OR "physiotherapy assistant*" OR "physical therapy assistant*") AND ((tiab("angina" OR "atherosclerosis" OR "atherosclerosis" OR "blood pressure" OR "cardio vascular disease" OR "cardio vascular diseases" OR "cardiometabolic risk factors" OR "cardiomyop*" OR "cardiovascular disease" OR "cardiovascular diseases" OR "cardiovascular diseases") OR tiab("cerebrovascular accident" OR "cerebrovascular accidents" OR "chest pain" OR "chest pains" OR "coronary artery disease" OR "coronary artery diseases" OR "coronary heart disease" OR "coronary heart diseases" OR "diabetes mellitus" OR "diabetes mellitus, type 2" OR "diabetes") OR tiab("diabetic" OR "diabetics" OR "dyslipidaemia" OR "dyslipidaemic" OR "dyslipidemia" OR "dyslipidemias" OR "dyslipidemic" OR "heart attack" OR "heart attacks" OR "heart disease risk factors" OR "heart disease" OR "heart diseases" OR "heart failure" OR "heart failures") OR tiab("hyper tension" OR "hypertension" OR "hypertension" OR "myocardial infarction" OR "myocardial infarctions" OR "obese" OR "obesity" OR "obesity" OR "obesity, abdominal" OR "obesity, morbid" OR "overweight" OR "overweight*" OR "peripheral artery disease" OR "peripheral artery diseases" OR "stroke" OR "strokes")) AND (tiab("physical therapist*" OR "physical therapists" OR kinesiotherapist* OR physiotherapist* OR "physiotherapy assistant*" OR "physical therapy assistant*") OR (MESH.EXACT.EXPLODE("Physical Therapists:N.02.360.790") OR MESH.EXACT.EXPLODE("Health Personnel:M.01.526.485"))) AND (tiab("attitude to

health" OR "attitude" OR "attitudes" OR "coping skill" OR "coping skills" OR "counselling" OR "diet therapies" OR "diet therapy" OR "diet therapy" OR "diet therapy" OR "education technologies" OR "educational model" OR "educational models" OR "educational technology" OR "exercise promotion" OR "exercise promotions") OR tiab("exercise therapies" OR "exercise therapy" OR "exercise therapy" OR "exercise therapies" OR "face to face" OR "goal setting" OR "group based" OR "group session*" OR "health behaviour" OR "health behaviours" OR "health behaviour" OR "health behaviours" OR "health education" OR "health education" OR "health knowledge, attitudes, practice") OR tiab("health promotion" OR "health promotion" OR "healthy lifestyle" OR "home based" OR "hospital based" OR "individual plan*" OR "individualised plan*" OR "individualized plan*" OR "life style" OR "lifestyle" OR "life style" OR "models, educational" OR "nutrition coach*" OR "nutrition management" OR "patient education as topic" OR "patient education handout") OR tiab("patient education" OR "patient handout*" OR "physical activities" OR "physical activity" OR "physical therapy modalities" OR "prevention" OR "skill training" OR "sleep health" OR "sleep management" OR "smoking cessation" OR "stress management" OR "weight management") OR (MESH.EXACT.EXPLODE("Health Education:I.02.233.332") OR MESH.EXACT.EXPLODE("Health Education:N.02.421.726.407") OR MESH.EXACT.EXPLODE("Education, Public Health Professional")))).

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3.5 Summary and Implications for Thesis

The systematic scoping review successfully identified and mapped physiotherapist-led health promotion (PLHP) strategies and the populations involved, providing insight into the current state of evidence. The review revealed that while evidence on PLHP is still limited, it is gradually expanding. Multi-modal interventions were commonly used, underscoring the complexity of cardiovascular risk factors and CVD. However, the studies varied widely, lacking a clear consensus on future research directions. Most focused-on exercise and physical activity, with limited incorporation of broader HP components and minimal use of behaviour change theories.

Additionally, studies from LMICs, especially from Africa, were scarce, and research predominantly used RCTs with few qualitative studies. Consequently, further research in the Cameroonian context is warranted. The review's findings have informed subsequent research phases of this research programme, highlighting the need for practical interventions that can be integrated into clinical practice. The remainder of this chapter builds on the scoping review by further examining these findings and exploring related literature areas.

3.6 Need for Physiotherapy Health Promotion in Low- and Medium-Income Countries

It is estimated that close to 80% of NCD-related deaths occur in low- and middle-income countries (LMICs) and that NCD-related deaths in Africa will soon surpass communicable, maternal, perinatal, and nutritional diseases (Bigna & Noubiap, 2019; Budreviciute et al., 2020). Unlike high-income countries, where individuals with NCDs typically have better access to preventive and therapeutic services, people in LMICs often face limited healthcare access and insurance coverage for these conditions (Budreviciute et al., 2020; Busetto et al., 2018; Hajat & Stein, 2018). In LMICs, physiotherapists primarily focus on therapeutic management and addressing complications of NCDs, often neglecting behaviour change and HP strategies (Dean, 2009). Although there is growing evidence of physiotherapists in Africa engaging in HP, efforts remain insufficient and require significant improvement (Musonda & Simpamba, 2021).

Cost-effective preventive measures, including behaviour-based HP interventions, have been reported as more successful than pharmacological approaches in reducing the burden of NCDs (Amegah, 2018; Bigna & Noubiap, 2019). These interventions have been shown to lower hypertension prevalence and raise awareness about modifiable risk

factors (Shin et al., 2021). There is a compelling need for physiotherapists in the region to increase the uptake of HP practice following the challenges of NCD management and considering that physiotherapists are effective in implementing lifestyle changes (Frerichs et al., 2012).

The scoping review (study 1) revealed that while evidence on PLHP is still growing, it is limited by the lack of studies emanating from Africa, including Cameroon. While exercise and physical activities were the primary interventions (85% of the studies), multi-modal interventions were commonly used, underscoring the complexity of cardiovascular risk factors and CVD. These findings align with the study by Ford and colleagues demonstrating that addressing multiple risk factors significantly contributes to decreasing the incidence of CVD (Ford et al., 2009). However, the extent to which Cameroonian physiotherapists are engaged in HP is unknown. Additionally, the specific areas and types of risk factor modifications they feel confident addressing are not well understood, highlighting critical areas for future research in Cameroon.

3.7 Factors Influencing Health Promotion by Physiotherapists (Barriers and Facilitators).

Despite evidence increasingly supporting the effectiveness of physiotherapists in delivering diverse HP interventions (Frerichs et al., 2012), the implementation of HP remains limited due to various interrelated factors directly related to the physiotherapists (internal factors) or other resources independent of physiotherapists (external). Physiotherapist-related factors include training, ability to apply evidence-based practices, personal beliefs and attitude towards HP (Willett et al., 2019). External factors influence HP independent of practising physiotherapists and include health literacy challenges, interdisciplinary collaboration, policies, poor resource allocation, and lack of managerial or administrative support that can affect HP integration (Grol & Grimshaw, 2003; Nair et al., 2021)

3.7.1 Barriers to Physiotherapist-Led Health Promotion

This section explores barriers to HP in physiotherapy, divided into internal (physiotherapist-related) and external (systemic or patient-related) factors.

Internal Barriers: Key internal barriers to HP among physiotherapists include insufficient skills and knowledge for implementing interventions that support positive health behaviours (Driver et al., 2017). This gap, often attributed to limited training, time constraints, and unclear role boundaries, impedes effective HP delivery (Alexanders et

al., 2015; Driver et al., 2017). Many physiotherapists report challenges in facilitating lifestyle changes, such as increased physical activity for patients with musculoskeletal conditions (Kunstler et al., 2019). Other challenges include passive treatment approaches, disinterest in promoting specific lifestyle changes (Bodner et al., 2011), and personal struggles with similar health issues, such as weight management (Morris et al., 2009), sleep issues (Coren, 2009; Siengsukon et al., 2017), cigarette smoking (Bodner & Dean, 2009; Pignataro et al., 2012) tend to be less active in these areas. Additionally, some physiotherapists perceive limited patient adherence and benefit from HP, reducing their enthusiasm to promote it (Freene et al., 2017).

Recently, Muntessu and colleagues assessing the evidence-based practice among Cameroonian physiotherapists reported poor general knowledge and understanding of EBP (26.3%), though with an overall positive attitude towards EBP (Muntessu et al., 2024). Data emanating from Cameroon on these factors are rare, highlighting the need for further research in this area.

External Barriers: Organisational challenges, such as short session times, lack of equipment, and insufficient resources (such as assessment tools and HP guidelines), make HP difficult to prioritise (Barrett et al., 2013; Eisele et al., 2020; Lowe et al., 2018). The absence of specific HP frameworks, especially for conditions like diabetes and hypertension, also limits effective intervention (Morris et al., 2009). Further barriers include language difficulties, patients' low interest or motivation for non-therapeutic exercises, and challenges posed by frail, elderly, or cognitively impaired patients (Barrett et al., 2013; Eisele et al., 2020; Freene et al., 2017; Lowe et al., 2018; Mulligan et al., 2011). Physical limitations and lack of access to recreational facilities add to these challenges, particularly for patients with disabilities who may need more structural support for HP engagement (Alexanders et al., 2015; Mulligan et al., 2011).

Tatah and colleagues, in their analysis of sectorial policy documents (n=17) on physical activity in Cameroon, reported that only the health sector explicitly acknowledged the role of physical activity in the prevention of NCDs (Tatah et al., 2021). This highlights contextual barriers to HP in Cameroon as relevant sectors such as transport, environment, infrastructure, and other physical activity policies focus on leisure. These findings highlight the need for collaboration on relevant policies to improve population health.

3.7.2 Facilitators

Effective HP in physiotherapy relies on several facilitators, which may be internal (physiotherapist-related) or external (environmental or patient-related).

Internal Facilitators: Key internal facilitators include the physiotherapist's ability to counsel and implement interventions effectively (Dean et al., 2019; Evans & Stewart, 2015). This requires knowledge of specific lifestyle conditions, an understanding of health behaviour change theories, and skills in techniques like motivational interviewing (Bezner, 2015; Bezner et al., 2017; Dean et al., 2019). Additionally, a proactive attitude towards HP, valuing its benefits, and personal motivation to promote healthy behaviours in patients are essential (Dean, 2009; Dean et al., 2019). Recognising HP's broader impact on health beyond simply treating conditions fosters a more comprehensive approach to behaviour change (Bezner et al., 2017; Dean et al., 2019). The positive attitude and interest in evidence-based practice reported among physiotherapists in Cameroon are encouraging as opportunities for capacity building and training are likely to be welcomed (Muntessu et al., 2024).

External Facilitators: External factors that enhance HP include patient interest and motivation, support from other healthcare professionals, and access to referral centres specialising in lifestyle changes (Eisele et al., 2020; Fisher et al., n.d.; Nauta et al., 2022). Collaborative teamwork among healthcare providers supports coordinated care and reinforces consistent messaging (Bezner et al., 2017; Nauta et al., 2022). Access to assessment tools, educational resources tailored to specific conditions, and personal health technology like smartphones and fitness trackers also support HP efforts (Barrett et al., 2013; Coren, 2009; Lowe et al., 2018; Nauta et al., 2022). Community initiatives, policy support, and improved access to recreational facilities further enable patients to adopt and sustain healthy behaviours (Douryang et al., 2023; Kunstler, 2020). The extent to which external factors may facilitate HP practice in Cameroon has yet to be clearly reported. This provides an opportunity for research exploration to assess factors that enhance HP practice among physiotherapists practising in Cameroon.

3.8 Strategies to Overcome Barriers to Health Promotion.

Effective HP is essential for supporting patients at all life stages, helping them take control of their health by adopting healthier behaviours (Dean et al., 2019; Kumar & Preetha, 2012). The goal is not only to influence individual health but also to recognise the impact of broader social and environmental factors that affect well-being (Alodaibi et al., 2022;

Bezner et al., 2017). Health protection, a core element of HP addresses these factors within communities and workplaces, where physiotherapists can serve as valuable consultants to policymakers (Dean et al., 2019). However, there is limited evidence emerging from Cameroon to strategically build capacity to overcome internal and external barriers to effective HP. The existing data, however, is encouraging, with positive attitudes reported among practising physiotherapists (Muntessu et al., 2024). Embracing HP strategies that are feasible and implementable in other contexts, such as the make every contact count, may be cost-effective in clinical practice. More local research is needed to identify factors that can influence the positive development of policies, training, and approaches tailored to the Cameroonian context.

3.8.1 Making Every Contact Count

The Making Every Contact Count (MECC) approach is currently one of the central strategies aimed at integrating HP into healthcare on a global scale (Haighton et al., 2021; Meade et al., 2022). MECC is a cost-effective public health strategy that enables public-facing workers to use routine interactions to encourage positive health behaviour changes, helping to drive behaviour change across the population (Haighton et al., 2021; Hemmings, n.d.). Endorsed by Public Health England, NHS England, and Health Education England, MECC is supported by programs designed to encourage its adoption and integration into clinical practice (*Making Every Contact Count (MECC)*, 2020).

MECC targets five key modifiable health behaviours: smoking cessation, alcohol misuse, physical inactivity, healthy eating, and mental health and wellbeing (Haighton et al., 2021; *Making Every Contact Count (MECC)*, 2020). It uses existing clinical encounters to motivate and guide patients in making positive changes to their physical and mental health. The approach is defined as follows: "MECC supports the opportunistic delivery of consistent and concise healthy lifestyle information and enables individuals to engage in conversations about their health at scale across organisations and populations. For staff, MECC means having the competence and confidence to deliver healthy lifestyle messages, to help encourage people to change their behaviour and to direct them to local services that can support them (Hemmings, n.d.; *Making Every Contact Count (MECC)*, 2020).

For physiotherapists, MECC implies an expectation that routine visits will address health behaviours impacting long-term health and wellbeing, in addition to the primary concerns for which a patient was referred. Given that conditions requiring physiotherapy often coexist with other comorbidities—and as multimorbidity in the general population

continues to rise (Barnett et al., 2012; Dennis, 2016; McPhail, 2016)—MECC provides a compelling, practical framework for healthcare providers to address health behaviours (Haighton et al., 2021; *Making Every Contact Count (MECC)*, 2020).

MECC promotes brief interventions (BIs) or very brief interventions (VBIs) within routine clinical interactions, distinguishing these from high-intensity behaviour change interventions, which demand greater time and resources. While brief advice is not part of the MECC model, it remains foundational in some clinical and public health guidance documents ('Behaviour Change: Individual Approaches', n.d.; Nichol et al., 2024).

Behaviour Change Terminology (adapted from guidance resources) ('Behaviour Change: Individual Approaches', n.d.; Nichol et al., 2024))

- **Brief Advice**:
- This involves verbal advice, discussion, negotiation, or encouragement, sometimes accompanied by written materials or follow-up support. It can range from simple advice to a more personalised conversation.
- **Very Brief Intervention (VBI)**:
- Lasting from 30 seconds to a few minutes, a VBI is typically aimed at providing basic information or directing individuals to further resources. It may include raising awareness of health risks and offering support for behaviour change, following an 'ask, advise, assist' structure. For example, a VBI on smoking might involve noting the individual's smoking status, advising on available stop-smoking services, and, if appropriate, directing them to these services for additional support.
- **Brief Intervention (BI)**:
- This includes discussion, negotiation, or encouragement, with or without written materials or follow-up. It may also involve referral to additional interventions or more intensive support options. These BIs can be delivered by any trained person and are typically provided when opportunities arise, usually lasting only a few minutes.
- **Extended Brief Intervention**:
- Similar to a BI but generally lasting over 30 minutes, this involves a more personalised discussion, either as a single session or across multiple shorter sessions.
- **High Intensity Interventions**:
- These interventions usually extend beyond 30 minutes and are delivered across multiple sessions.

MECC interventions utilise an 'Ask, Advise, Assist' approach but lack specific guidance on the exact actions within each intervention (‘Behaviour Change: Individual Approaches’, n.d.). While this flexibility allows clinicians to adapt the approach to different practice settings and personal styles, it can also present challenges associated with heterogeneity in practice and poor communication of interventions and outcomes across several behaviours. This can unavoidably lead to poor outcomes in practice (Haighton et al., 2021; Nichol et al., 2024).

3.9 Chapter Summary

This chapter presented the relevant literature to the research programme by exploring and presenting concepts such as health, HP and disease prevention and how physiotherapists are engaging in lifestyle conditions globally. The scoping review on PLHP strategies is also presented, as well as its implications and contributions to the research programme. The findings suggest that exercise and physical activity are the principal strategies employed by physiotherapists, with limited evidence emanating from LMICs. While studies employ multimodal interventions, the use of behaviour change interventions was very limited. It highlights why physiotherapists in the Cameroonian context should engage and contribute to HP and disease prevention, especially with the limited healthcare capacity. Relevant literature has also been synthesised and presented on factors that influence HP practice among physiotherapists. Physiotherapist-related factors have been reviewed, and external or system-related barriers and facilitators have also been identified. Limited data on HP and the Cameroonian context has been identified, and the need for more research in specific areas is highlighted. The next chapter explores the first primary study conducted in Cameroon among physiotherapists and its contributions to the research programme.

Chapter Four: A Survey of Practice and Factors Affecting Physiotherapist-Led Health Promotion for People at Risk or with Cardiovascular Diseases in Cameroon (Study 2)

4.1 Introduction

This chapter details the national cross-sectional survey conducted in Cameroon as a key component of the research programme. It opens with an overview of the study's context and role within the research agenda. The complete publication includes an in-depth discussion covering key findings, strengths, limitations, and implications. The chapter concludes with an outline of how this phase informed the design of the subsequent qualitative study (Study 3).

This is the first primary study within this research programme investigating the HP practices of physiotherapists in Cameroon. It also sets the stage for the qualitative study presented in Chapter 5. A cross-sectional survey was chosen as the most appropriate approach, as collecting data at a single point was sufficient to meet the second programme objective (*To examine current physiotherapy practice in health promotion for pwCVD in Cameroon*) (see Table 1 in section 1.11)

The study was accepted on August 27, 2024, and subsequently published in the peer-reviewed *Journal Clinics and Practice* on August 29, 2024. Since publication, the article has been viewed 863 times (as of December 3, 2024) and widely shared on social media.

4.2 Published Paper: Study 2

Study 2 is reproduced here, with the publisher's permission, in the format published online.

4.2.1 Erratum: A Survey of Practice and Factors Affecting Physiotherapist-Led Health Promotion for People at Risk or with Cardiovascular Diseases in Cameroon.

Section 3.1 in the published version reproduce here, it is not explicitly mentioned that 181 respondents were included in the analysis, with 9 reporting that they did not address any form of HP behaviours. Consequently, beyond the demographic data, the analysis of HP engagement included 172 respondents.

The following tables have been reproduced here to highlight the missing responses (number of respondents).

Table 2: Health promotion practices of 172 physiotherapists for people at risk or with cardiovascular disease in Cameroon.

Please indicate which of the relevant areas best describe your interventions?				
	Never	Sometimes	Always	Missing responses (n=172)
Discuss weight management.	8% (n=14)	18% (n=30)	74%(n=123)	5
Dietary advice regarding eating more fruits	6% (n=10)	21% (n=35)	73%(n=127)	0
Increase general physical activity	2% (n=3)	30% (n=51)	69%(n=118)	0
Increase specific exercise uptake	3% (n=5)	28% (n=48)	69%(n=118)	1
Encourage the patient to stop smoking.	11% (n=18)	21% (n=35)	69%(n=116)	2
Dietary advice to decrease excessive salt use	13%(n=22)	22% (n=38)	65%(n=111)	1
Condition-specific education for patients with Known chronic Cardiovascular Conditions	8% (n=14)	28% (n=47)	64%(n=109)	2
Counsel to manage stress	9% (n=16)	30% (n=50)	61%(n=103)	3
Dietary advice regarding eating more vegetables	9% (n=15)	32% (n=54)	60%(n=102)	0
Explain the value of BMI as a measure of health	13% (n=22)	29% (n=49)	58%(n=98)	3
Education around normal sleeping patterns.	17% (n=29)	34%(n=57)	48%(n=83)	3

Table 3: Physiotherapist's level of confidence engaging in health promotion practice

Are you confident in assessing the lifestyle and behaviour of people at risk or with CVDs?				
	Not confident at all	Slightly confident	confident	Missing responses (n=172)
Weight	14% (n=24)	22% (n=38)	64%(n=110)	0
Alcohol use	19% (n=33)	25%(n=43)	56%(n=95)	1
Physical activity	11% (n=18)	36%(n=61)	53%(n=92)	1
Stress management	14% (n=23)	30%(n=50)	56%(n=95)	4
Diet	15% (n=26)	35%(n=59)	50%(n=84)	3
Sleep	24% (n=41)	36%(n=61)	39%(n=67)	3

Table 4: Factors affecting HP practice based on respondents (n=172)

To what extent do you agree with the following statements:				
POTENTIALLY LIMITING HP PRACTICE				
Intrapersonal factors	Disagree	Undecided	Agree	Missing responses (n=172)
I commonly use health promotion for those at high risk of CVD or those with complications only.	15%(n=26)	21%(n=36)	64%(n=110)	0

I believe the professional role of physiotherapists is to primarily treat patients using passive modalities	42%(n=72)	27%(n=47)	30%(n=53)	0
Interpersonal factors				
I lack the skills and economic resources to implement health promotion in my practice.	51%(n=87)	21%(n=36)	28%(n=49)	0
I use my personal lifestyle experiences to facilitate health promotion for patients	6%(n=11)	17%(n=30)	76%(n=131)	0
My patients lack the interest to adhere to health promotion recommendations	40%(n=68)	36%(n=61)	25%(n=42)	1
Institutional factors				
I have regular training (continuous professional development) in health promotion	35%(n=60)	25%(n=43)	40%(n=68)	1
There are no resources on health promotion in my institution	53%(n=90)	24%(n=40)	23%(n=39)	3
We lack an organized practice with referral units like nutrition service and counselling units	27%(n=47)	20%(n=35)	53%(n=90)	0
The lack of role clarification with other healthcare providers hinders health promotion practice in my institution.	41%(n=70)	27%(n=46)	32%(n=55)	1
I lack office space for health promotion	51%(n=88)	22%(n=38)	27%(n=46)	0
Community/Public factors				
There are no existing guidelines for prevention of CVD in our setting	48% (n= 82)	24%(n=41)	28%(n=49)	0
There are no physiotherapy health promotion practices in public hospitals or settings	48%(n=82)	30%(n=52)	22%(n=38)	0
There are no physiotherapy health promotion practices in a private hospital	42%(n=73)	40%(n=69)	17%(n=30)	0
POTENTIALLY ENHANCING HP PRACTICE				
Intrapersonal factors	Disagree	Undecided	Agree	
Medical management is more important than lifestyle modification for chronic conditions	63%(n=110)	22%(n=37)	15%(n=25)	0
I am confident I have appropriate skills and knowledge on health promotion and disease prevention	6%(n=11)	22%(n=38)	68%(n=123)	0
Because of my personal difficulty dealing with a lifestyle issue like being overweight, smoking, etc, I find it difficult to talk about similar issues with my patients	67%(n=115)	19%(n=32)	14%(n=24)	1
I normally do not waste my time on health promotion for patients as it will not be effective.	74%(n=127)	12%(n=21)	13%(n=22)	2
I believe that there will be no change in patients' behaviour even if I provide lifestyle recommendations	71%(n=121)	13%(n=23)	16%(n=28)	0
Interpersonal factors				
I have confidence in my team members and colleagues to assist me in implementing health promotion in my practice	8%(n=14)	22%(n=38)	70%(n=119)	1
I do not practice health promotion because it will conflict with the original reason for patient consultation	75%(n=128)	13%(n=22)	12%(n=21)	1
Institutional factors				
I lack the time to implement health promotion in my practice.	59%(n=100)	24%(n=40)	17%(n=30)	2
My working conditions do not permit me to implement health promotion.	52%(n=89)	28(n=48)	20%(n=34)	1
I do not practice health promotion because there are no financial benefits to health promotion	66%(n=113)	18%(n=31)	16%(n=28)	0
Community/Public factors				
Because of the social class or status of some patients, I find it difficult to discuss health promotion recommendations	56%(n=97)	25%(n=43)	19%(n=32)	0
Religious practices make it difficult for me to promote health in my practice.	61%(n=104)	20%(n=35)	19% (n= 33)	0

Because of cultural practices and language, I find it difficult to implement health promotion in my practice.	59%(n=102)	23%(n=39)	18%(n=31)	0

clinics and practice

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Article

A Survey of Practice and Factors Affecting Physiotherapist-Led Health Promotion for People at Risk or with Cardiovascular Disease in Cameroon

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Abstract: Background: Cardiovascular diseases (CVDs) and associated risk factors are a growing concern in Cameroon. Physiotherapists (PTs) can play a crucial role in prevention and management. However, the extent of Cameroonian PT involvement in health promotion (HP) activities remains unclear. This study assessed Cameroonian physiotherapists' current HP practices for people at risk of or with CVDs (pwCVDs). Methods: A cross-sectional survey was administered online to PTs practising in Cameroon. Results: Out of 181 PT responses, 95% reported providing a variety of HP activities, including weight management (74%), dietary advice (73%), physical activity (69%), smoking cessation (69%), stress management (61%), and sleep promotion (48%). While PTs were confident in lifestyle assessments, they felt less confident about sleep interventions. Strong beliefs, confidence, team support, and time allocation enhanced HP practice. However, preference for passive modalities, patient adherence issues, organisational challenges, role ambiguity among healthcare providers, inadequate training opportunities, and the absence of established guidelines for CVD prevention negatively affect HP practice. Conclusions: These findings highlight the challenges and opportunities for enhancing HP delivery within the physiotherapy profession in Cameroon. The findings are useful for future strategies by clinical practitioners and policy makers to address barriers and leverage facilitators effectively for scaling up HP initiatives in Cameroon.

Keywords: physiotherapy; health promotion; risk factors; cardiovascular diseases; Cameroon

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1. Introduction

More than two-thirds of all global deaths are attributed to four chronic non-communicable diseases (CNCDs): cardiovascular disease (CVD), cancer, chronic lung diseases, and diabetes [1]. CVD is the leading cause of death globally, with an estimated 20.5 million deaths in 2021 [2], and accounts for 38% of all global premature deaths [1,3]. The burden of CVD is increasing, with over 80% of all global cases and deaths in low- and medium-income countries (LMICs) [3,4]. Although risk factors are similar globally, CVDs are increasing in LMICs due to changing lifestyles (Westernisation) and health behaviours, including physical inactivity, increased use of tobacco, poor nutrition, obesity, and harmful use of alcohol [5]. These, together with other medical risk factors such as hypertension, dyslipidaemia, and diabetes associated with limited resources for effective prevention and management, contribute to the escalating prevalence and mortality of CVDs in LMICs like Cameroon [6].

In Cameroon, CVDs and associated risk factors are on the rise. According to 2015 estimates, 30.8% of Cameroonian women lived with hypertension, compared with 27.0% for both genders in Africa and 20.1% globally [7], accounting for 41.3–54.5% of heart diseases in Cameroon [8,9]. CVD accounted for 10–16% of hospital admissions, with heart failure (38.5%), stroke (33.3%), and uncontrolled hypertension (22.4%) being the most common [9]. In 2012, 12% of total deaths in Cameroon were attributed to CVD [10]. On average, 43.8% of adult Cameroonian males use tobacco, compared to 36.1% globally. Additionally, 28.5% of adults are physically inactive compared to 27.5% globally [11]. A community-based cross-sectional study among adults reported poor awareness of CVDs and associated risk factors among participants [12]. The fragile health system, limited health promotion (HP), disease prevention policies, and implementation might contribute to the increasing prevalence of CVD risk factors [13]. In this work, we defined HP as any proactive measures to improve patients' quality of life and health.

Most CVD risk factors are modifiable and can be prevented by addressing lifestyle changes such as tobacco use, unhealthy diet and obesity, harmful use of alcohol, poor stress management, physical inactivity, and poor sleep quality [14]. These risk factors can be reduced and prevented through relevant HP practices that enable people to increase control over and improve their health [15,16]. Physiotherapists (PTs) support patients with different conditions, including people at risk of developing or living with CVDs (pwCVDs) [17]. We defined pwCVDs as PT clients with lifestyle risk factors (smokers, alcohol use, and physical inactivity), medical risk factors (diabetes and hypertension), and diagnosed CVD (coronary artery disease and heart failure) [5]. PTs have regular/frequent opportunities to provide their clients with HP advice. As an informed non-medical profession, with health education, physical interventions, and exercise at the core of their practice [18,19], PTs can support management of these lifestyle-related conditions [20,21] using biopsychosocial and holistic approaches [22]. PTs may be an untapped resource for addressing the CVD epidemic in Cameroon, especially with the absence of specialised units and CVD prevention programmes [23]. PT-led health promotion (PLHP) refers to the involvement of PTs in designing, implementing, and guiding strategies and interventions that promote overall health, prevent injuries, and enhance well-being [24]. Personal, professional, institutional, and community policies and clinical guidelines have been shown to influence PT HP practice elsewhere [25–27]. The extent to which HP is covered in the curriculum and training of PTs and their HP practice in Cameroon is not known.

This study aimed to evaluate current PLHP practices and factors affecting PLHP for pwCVDs in Cameroon. The results may help develop and propose strategies and guidelines to improve PLHP practices and health outcomes for pwCVDs in the country.

2. Materials and Methods

2.1. Study Design

This study was designed as an online cross-sectional survey to assess HP practice by PTs and factors affecting PLHP activities in Cameroon.

2.2. Study Area

The study area included all private and public health facilities in Cameroon where PTs practise. Most PTs are concentrated in urban areas, with very few physiotherapy services delivered in rural areas [17].

Cameroon Society of Physiotherapy (CASP) assumes the governing and regulatory professional role for PTs in Cameroon [28]. CASP does not have complete data for PTs, but previous studies estimate between 250 and 400 PTs are practising in Cameroon [29,30].

2.3. Study Population

The study population included PTs who are 21 years and above, practising in Cameroon in any region, including public, private, or mission health facilities, and have at least

two years of physiotherapy training and one year of clinical practice. Eligible participants had to be able to read and understand English.

2.4. Sample Size

A non-probability (convenience) sampling method was used for this survey due to challenges in determining the number of potential participants. CASP data on the number and characteristics of PTs in Cameroon is incomplete, with only 44 PTs having complete data. The existing literature estimates the number of PTs in Cameroon to vary between 250 and 400 [29,30]. Consequently, the minimum sample size estimated for this study was based on the sample size of 141 study participants used in a similar study in Nigeria [31].

2.5. Survey Instrument

The survey development was informed by previous studies [27,32] and guidelines in survey development [33]. The survey was designed to capture data in three main areas: Section A: demographics; Section B: current health promotion practice; and Section C: factors affecting HP practice at four ecological levels [27]. Demographic variables included age, gender, training, duration of training and clinical experience, health sector, and region of practice. Data on current practice included exercise and physical activity promotion, dietary advice, weight management, smoking cessation, sleep, stress management, and level of confidence in promoting them. In Section C, a four-level ecological model was used to assess factors affecting HP practice, and data on intrapersonal, interpersonal, institutional, and community influences were collected. Closed questions were used to enable management and analysis of responses following guidelines for development and reporting of the survey [33,34]. The developed survey instrument was pilot-tested on a sample of 5 PTs practising in Cameroon who were not included in the study. All feedback was integrated to improve the survey instrument.

2.6. Recruitment and Data Collection

The recruitment of the study participants and data collection was conducted from 1 November 2023 to 31 January 2024. For recruitment, we used the CASP register or mailing list to identify eligible PTs for the study. This group of PTs was asked to promote the survey through their physiotherapy social media networks and community of practice groups at regional and national levels to facilitate recruitment of other PTs practising in Cameroon but who have yet to register with CASP (snowballing) [33]. The survey instrument was administered online using Qualtrics. Participants were able to complete the survey online using electronic devices such as laptops, iPads, and cell phones [33]. Reminders were sent every two weeks during the period the survey was live to ensure maximum response.

2.7. Data Analysis

The web-based data collected were screened for complete responses and downloaded in a Microsoft Excel 2021 document format by the lead author. The data were then transferred to SPSS (IBM SPSS Statistical Software, version 23.0) for statistical analysis. Descriptive statistics (frequencies, central tendency, dispersion/variation, and percentages) were used to present the demographic information and pattern of practice among participants. All missing data (either due to omitted responses or the 'not applicable' option) were considered in the analysis.

3. Results

3.1. Participant Characteristics

Responses to the survey questionnaire were obtained from a total of 230 participants. Of these, 38 (16.5.%) were incomplete or poorly completed, and 11 (4.7%) respondents did not meet the inclusion criteria and therefore were not included in the analysis. Table 1 presents the general characteristics of the study participants. Of the 181 respondents included in the analysis, 53% (n = 96) were male and 47% (n = 85) female, with a mean

age of 34.43 ± 9.0 years and a mean working experience of 8.96 ± 6.0 years. The mean number of PTs per service was 4.31 ± 4.60, with the highest responses coming from the central region of Cameroon (37.6%, *n* = 68). Most respondents were trained in Cameroon (95.6%, *n* = 173) and based in urban settlements (86.7%, *n* = 157). Of the total sample, 19.3% (*n* = 35) had a clinical speciality, with the highest being sport (*n* = 11). Most respondents practised in the private sector, 40.3% (*n* = 73), with 28.2% working in both the public and private sectors.

Table 1. Socio-demographic characteristics of the 181 physiotherapists enrolled in the study.

Variable		*n*	%
Sex	Male	96	53.0
	Female	85	47.0
Mean age (years)	34.43 ± 9.0	181	100
Mean working duration	8.96 ±6.0	181	100
Mean number of PTs per service	4.31 ± 4.60	181	100
Educational level	Higher Diploma	75	41.4
	Bachelor's Degree	81	44.4
	Master's Degree	22	12.2
	Others	3	1.7
Location of participants	Central	68	37.6
	East	4	2.2
	Far North	3	1.7
	Littoral	51	28.2
	North	1	0.6
	North-West	27	14.9
	South-West	21	11.6
	West	6	3.3
Location of training	Cameroon	173	95.6
	Africa	4	2.3
	Europe	3	1.7
	United States	1	0.6
Clinical specialism	Musculoskeletal	7	3.9
	Cardiorespiratory	3	1.7
	Neurology	6	3.3
	Paediatric	3	1.7
	Sports	11	6.1
	No speciality	151	83.4
Settlement	Rural	24	13.3
	Urban	157	86.7
Sector of work	Private	73	40.3
	Public	51	28.2
	Both private and public	51	28.2
	Others (NGOs and missionary hospitals)	6	3.3
Current institution of practice	Tertiary hospital	29	16.0
	Secondary/regional hospital	29	16.0
	District hospital	23	12.7
	Community health centre	4	2.2
	Clinic	54	29.8
	Rehabilitation centre	32	17.7
	Special school	2	1.1
	Education/university	13	7.2
	Others	19	10.5

Notes: PT; physiotherapist, NGO; non-governmental organisation.

3.2. PT Practice and Levels of Confidence of HP for PwCVDs

PT HP practice is reported in Table 2. Overall, 95% (n = 172) of participants reported that they provide HP to pwCVDs. Most respondents reported that they always conduct HP around weight management (74%, n = 123), dietary advice to increase fruit intake (73%, n = 127), and exercise and physical activity (69%, n = 118). Fewer PTs deliver education around BMI (58%, n = 98) and sleep (48%, n = 83).

Table 2. Health promotion practices of 172 physiotherapists for people at risk of or with cardiovascular disease in Cameroon.

Please Indicate Which of the Relevant Areas Best Describes Your Interventions.			
	Never	**Sometimes**	**Always**
Discuss weight management	8% (n = 14)	18% (n = 30)	74% (n = 123)
Dietary advice regarding eating more fruits	6% (n = 11)	21% (n = 35)	73% (n = 127)
Increase general physical activity	2% (n = 3)	30% (n = 51)	69% (n = 118)
Increase specific exercise uptake	3% (n = 5)	28% (n = 48)	69% (n = 118)
Encourage the patient to stop smoking	11% (n = 18)	21% (n = 35)	69% (n = 116)
Dietary advice to decrease excessive salt use	13% (n = 22)	22% (n = 38)	65% (n = 111)
Condition-specific education for patients with Known chronic Cardiovascular Conditions	8% (n = 14)	28% (n = 47)	64% (n = 109)
Counsel to manage stress	9% (n = 16)	30% (n = 50)	61% (n = 103)
Dietary advice regarding eating more vegetables	9% (n = 15)	32% (n = 54)	60% (n = 102)
Explain the value of BMI as a measure of health	13% (n = 22)	29% (n = 49)	58% (n = 98)
Education around normal sleeping patterns	17% (n = 29)	34% (n = 57)	48% (n = 83)

The majority of respondents were aware of public and clinical guidelines for physical activity (76%, n = 130), exercise (73%, n = 124), and weight management (71%, n = 121), compared to sleep at 53% (n = 91) (see Figure 1). Most PTs deliver HP advice verbally (80%), with apps (69%, n = 118) and websites (63%, n = 109) never used (Figure 2).

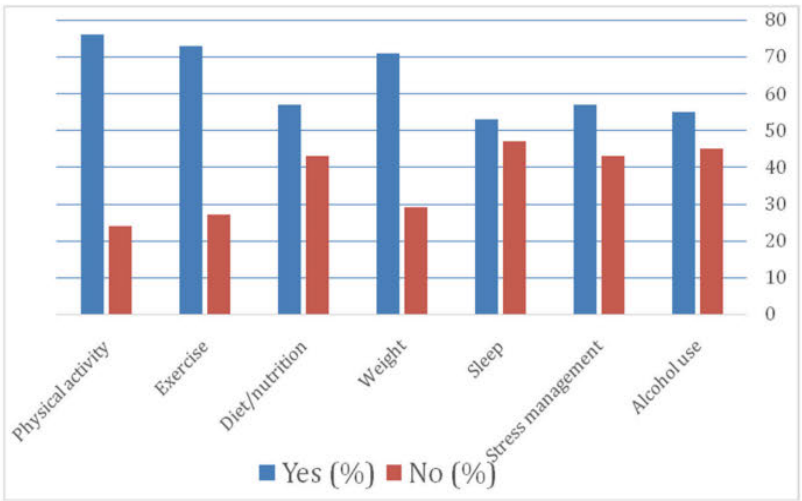

Figure 1. Physiotherapists' awareness of public and clinical guidelines (n = 172).

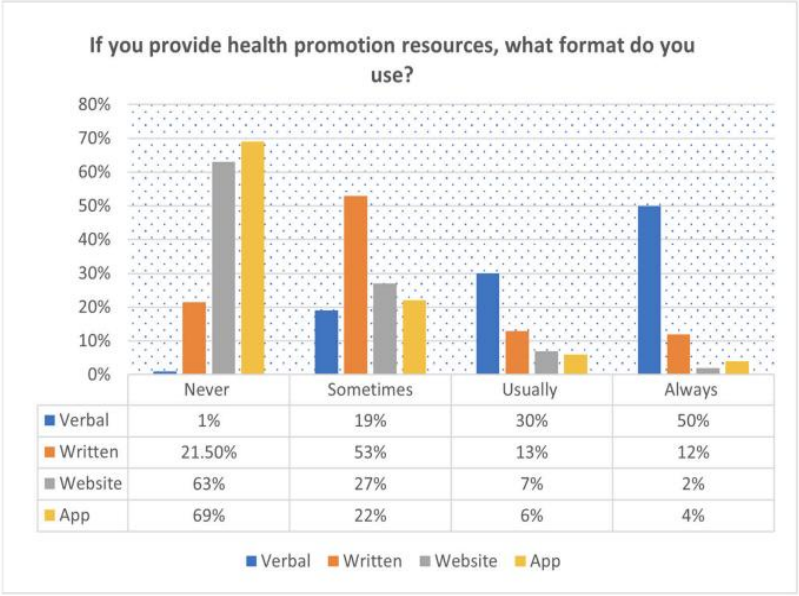

Figure 2. Format of health promotion practice for people at risk of or with cardiovascular diseases of 172 physiotherapists in Cameroon.

Table 3 provides details on PTs' confidence level, with the majority confident in assessing lifestyle elements such as weight management (64%, n = 110) and alcohol use (56%, n = 95). PTs reported being slightly confident or lacking confidence in undertaking HP activities involving sleep (61%, n = 102) and diet (50%, n = 85). Overall, 45–69% of the respondents indicated that they assess the level of confidence of pwCVDs to engage in HP in their practice, with 9–20% reporting that they have never assessed the confidence level to improve lifestyle changes for pwCVDs. In addition, 46–61% of the respondents reported that they always address challenges pwCVDs may face across several components of HP and provide them with optimal recommended values in areas such as physical activity, details in Supplementary Table S1.

Table 3. Physiotherapists' level of confidence engaging in health promotion practice.

Are You Confident in Assessing the Lifestyle and Behaviour of People at Risk or with CVDs?			
	Not Confident at All	**Slightly Confident**	**Confident**
Weight	14% (n = 24)	22% (n = 38)	64% (n = 110)
Alcohol use	19% (n = 33)	25% (n = 43)	56% (n = 95)
Physical activity	11% (n = 18)	36% (n = 61)	53% (n = 92)
Stress management	19% (n = 32)	29% (n = 50)	52% (n = 95)
Diet	15% (n = 26)	35% (n = 59)	50% (n = 84)
Sleep	24% (n = 41)	36% (n = 61)	39% (n = 67)

3.3. Factors Affecting HP Practice among PTs in Cameroon for pwCVDs

Factors affecting HP are detailed in Table 4. At the intrapersonal level, professional beliefs about using HP only for those at high risk were held by 64% of respondents (n = 110) and using passive modalities in practice by 30% (n = 53), which may negatively affect HP practice. Participants reported having the relevant skills and knowledge to deliver HP (68%, n = 123) and believe that disease prevention and lifestyle modification are essential for

managing chronic conditions (63%, n = 110). At the interpersonal level, the use of personal lifestyle experiences for HP reported by 76% of respondents (n = 131), lack of skills and economic resources (28%, n = 49), and pwCVDs not adhering to HP recommendations (25%, n = 42) may negatively affect HP practice. Interpersonal factors include having confidence in team members, reported by 70% (n = 119), and aligning HP interventions with reasons for consultations, reported by 75% (n = 128) of the respondents. Factors hindering HP practice at the institutional level include lack of organised practice (53%, n = 90), poor role clarification (32%, n = 55), and the absence of regular training opportunities on HP (40%, n = 68). The primary institutional factors include favourable working conditions (52%, n = 89) and having time for HP practice (59%, n = 100) even without financial incentives (59%, n = 100). The lack of existing guidelines on CVD prevention (28%, n = 49) in the Cameroonian setting may hinder HP practice at the community and public levels. Non-interference of religion (61%, n = 104) and culture (59%, n = 102) on HP among respondents may enhance practice.

Table 4. Factors affecting HP practice based on respondents (n = 172).

To What Extent Do You Agree with the Following Statements:			
POTENTIALLY LIMITING HP PRACTICE			
Intrapersonal Factors	**Disagree**	**Undecided**	**Agree**
I commonly use health promotion for those at high risk of CVD or those with complications only	15% (n = 26)	21% (n = 36)	64% (n = 110)
I believe the professional role of physiotherapist is to primarily treat patients using passive modalities	42% (n = 72)	27% (n = 47)	30% (n = 53)
Interpersonal factors			
I lack the skills and economic resources to implement health promotion in my practice	51% (n = 87)	21% (n = 36)	28% (n = 49)
I use my personal lifestyle experiences to facilitate health promotion for patients	6% (n = 11)	17% (n = 30)	76% (n = 131)
My patients lack the interest to adhere to health promotion recommendations	40% (n = 68)	36% (n = 61)	25% (n = 42)
Institutional factors			
I have regular training (continuous professional development) in health promotion	35% (n = 60)	25% (n = 43)	40% (n = 68)
There are no resources on health promotion in my institution	53% (n = 90)	24% (n = 40)	23% (n = 39)
We lack an organised practice with referral units like nutrition service and counselling units	27% (n = 47)	20% (n = 35)	53% (n = 90)
The lack of role clarification with other healthcare providers hinders health promotion practice in my institution	41% (n = 70)	27% (n = 46)	32% (n = 55)
I lack office space for health promotion	51% (n = 88)	22% (n = 38)	27% (n = 46)
Community/public factors			
There are no existing guidelines for prevention of CVD in our setting	48% (n = 82)	24% (n = 41)	28% (n = 49)
There are no physiotherapy health promotion practices in public hospitals or settings	48% (n = 82)	30% (n = 52)	22% (n = 38)
There are no physiotherapy health promotion practices in a private hospital	42% (n = 73)	40% (n = 69)	17% (n = 30)

Table 4. *Cont.*

To What Extent Do You Agree with the Following Statements:			
POTENTIALLY ENHANCING HP PRACTICE			
Intrapersonal Factors	**Disagree**	**Undecided**	**Agree**
Medical management is more important than lifestyle modification for chronic conditions	63% (n = 110)	22% (n = 37)	15% (n = 25)
I am confident I have appropriate skills and knowledge on health promotion and disease prevention	6% (n = 11)	22% (n = 38)	68% (n = 123)
Because of my personal difficulty dealing with a lifestyle issue like being overweight, smoking, etc, I find it difficult to talk about similar issues with my patients	67% (n = 115)	19% (n = 32)	14% (n = 24)
I normally do not waste my time on health promotion for patients as it will not be effective	74% (n = 127)	12% (n = 21)	13% (n = 22)
I believe that there will be no change in patients' behaviour even if I provide lifestyle recommendations	71% (n = 121)	13% (n = 23)	16% (n = 28)
Interpersonal factors			
I have confidence in my team members and colleagues to assist me in implementing health promotion in my practice	8% (n = 14)	22% (n = 38)	70% (n = 119)
I do not Practise health promotion because it will conflict with the original reason for patient consultation	75% (n = 128)	13% (n = 22)	12% (n = 21)
Institutional factors			
I lack the time to implement health promotion in my practice	59% (n = 100)	24% (n = 40)	17% (n = 30)
My working conditions do not permit me to implement health promotion	52% (n = 89)	28(n = 48)	20% (n = 34)
I do not practice health promotion because there are no financial benefits to health promotion	66% (n = 113)	18% (n = 31)	16% (n = 28)
Community/public factors			
Because of the social class or status of some patients, I find it difficult to discuss health promotion recommendations	56% (n = 97)	25% (n = 43)	19% (n = 32)
Religious practices make it difficult for me to promote health in my practice	61% (n = 104)	20% (n = 35)	19% (n = 33)
Because of cultural practices and language, I find it challenging to implement health promotion in my practice	59% (n = 102)	23% (n = 39)	18% (n = 31)

4. Discussion

To our knowledge, this is the first study to evaluate practice and factors affecting PLHP for pwCVDs in Cameroon. PTs reported generally high levels of HP practice and confidence to deliver on several components.

4.1. PT Practice of HP for PwCVDs by PTs

The majority of PTs in Cameroon report that they currently deliver several HP components for pwCVDs. Higher proportions of PTs reported delivering on weight management (74%) and dietary advice to eat more fruit (73%) than exercise and physical activities (69%) and sleep (48%). Previous African studies have focused on knowledge, attitudes, and practices towards HP and physical activities among PTs [35]. Studies conducted in Ghana and Nigeria reported that 87% and 92.2% of PTs, respectively, incorporate some aspect of HP in the delivery of care [36,37]. While few studies focused on specific components of HP, some studies have reported similar percentages of integrating HP in practice. Many reported values of HPs were higher than those reported in some African and high-income countries [35,38,39]. For instance, studies conducted in Ghana and Rwanda reported similar values regarding diet and physical activity recommendations [37,38]. Our respondents also reported a higher integration of HP practice in physical activities, smoking cessation, and

sleep than in studies conducted in Nigeria, Canada, and Jordan [39–41]. Despite 81.5% agreeing that nutritional/dietary counselling is within their scope of practice, less than 50% of Irish and Australian PTs assessed the nutritional status of patients, and even fewer PTs provided nutritional interventions [42–44]. The generally lower reported HP activities in previous studies may be due to being conducted in the general patient populations rather than pwCVDs. In pwCVDs, PTs may be more likely to consider the risk and lifestyle factors and what they can do in their role as PTs. It is therefore necessary that studies evaluating the practice of HP for individual components, such as nutritional/dietary counselling, be conducted among PTs in Cameroon to obtain a clearer picture.

4.2. PT Levels of Confidence to Deliver HP for PwCVDs

Consistent with prior research, our data indicate lower confidence levels in delivering HP interventions across all reported behaviours [39–41]. We report a similar level of confidence (50%) in delivering dietary advice as in Nigeria (50%) [45] and lower levels of confidence in delivering physical activity (53%) compared to 75% and 93% reported in Nigeria and Australia, respectively [39,43]. The lower level of confidence in physical activity is concerning as this is a primary focus in PT practice. A lack of physical activity policies and implementation in Cameroon may explain this [13]. We reported higher levels of confidence in delivering advice on alcohol use (56%) compared to Nigeria (42.5%) [45] and sleep (39%) compared to reports from Jordan (12%) [41,46]. Conversely, 57% of United States PTs reported routinely assessing their patient's sleep behaviours [46]. The difference in confidence levels reported across HP components could be accounted for by the different study populations, pwCVDs in our case, and patients in general physiotherapy practice in most previous studies. Also, the purpose and design of data collection instruments in those studies may influence reported outcomes even in a similar context like Nigeria and Cameroon. The focus of our study on pwCVDs might have influenced PTs to think and report their role in modifiable risk factors, not their actual confidence in practice, leading to respondent bias in the study. The PTs in the United States might have access to more formal training, clinical guidelines, and collaborating experts (dieticians/nutritionists, clinical sleep specialists, and psychologists) providing support and increasing confidence in their role in HP practice [46].

Our data align with findings among healthcare students in England; confidence in delivering HP interventions increases in areas of practice with specialists and transparent referral processes [47]. Also, the availability and volume of training in undergraduate physiotherapy courses to deal with a range of HP activities is likely to impact PTs' confidence in delivering HP activities in practice [47].

Physiotherapy practice is usually centred on physical activity and exercise, and with the bio-psychological model, PTs' scope of practice has been expanding [19]. Areas such as alcohol use, smoking cessation, stress management, and sleep are still being embraced within the scope of PT practice in Cameroon; confidence and skills to deliver in these areas have been historically low in both high- and low-resource settings [41,46,48]. Confidence is associated with training, but the extent to which HP is integrated into physiotherapy training in Cameroon is not known. Lack of relevant training, including guided counselling and behaviour change techniques such as motivational interviewing, may contribute to low levels of confidence, given behaviour change is required across these lifestyle components [49]. Further studies are warranted to assess factors associated with practices and interventions around specific lifestyle factors in Cameroon. Recent studies demonstrate that PT knowledge and experience are limited in different lifestyle behaviours and conditions, including but not limited to smoking, nutrition, sleep, and stress management, with an increasing need for further education/training to address these behaviours [50,51].

PTs predominantly provide verbal advice to pwCVDs, with relatively little written or printed materials, websites, and apps. This may be associated with the need for more resources, proper educational materials, and expertise on HP, making standard reference material challenging. Even the elderly pwCVDs associate with some form of digital de-

vice or that of their carers. Recent trials elsewhere demonstrate the high acceptability of technological-based interventions in rural older adults with obesity [52,53]. Despite contextual barriers in Cameroon, technology-based intervention for HP remains a viable option.

4.3. Factors Affecting HP Practice for pwCVDs

Consistent with the existing literature, respondents in this study reported that intrapersonal factors such as solid professional beliefs, appropriate skill set and knowledge, motivation, positive attitude, and self-confidence towards HP could potentially improve HP practice (Table 4) [37,42,47]. This favours long-term engagement and practice of HP for pwCVDs in Cameroon and influences how HP issues are perceived and addressed. PTs with strong professional beliefs and skills concerning HP are likely to promote their role at different ecological levels (interpersonal, institutional, and public/community). Our findings align well with the global calls to enhance PTs' contributions to promoting health in daily practice with relevant competencies across different components of HP [19].

Factors potentially limiting HP practice consistent with previous research were identified [35]. These include the lack of regular training, limited resources, lack of specialist referral pathways, and poor role clarification with other clinicians, similar to reports from other Africa-based studies and elsewhere [35,43,44]. Despite time being commonly cited as a barrier in studies from Africa and high-income countries [35,41], the majority of PTs felt that they had the time and working conditions that would allow them to deliver HP activities [35]; this may explain the relatively high level of reported HP activities. This suggests that the priority given to the lack of knowledge, skills, resources, and confidence in improving specific behaviours outweighs the importance of practice time, underscoring the severity of these factors. The situation may vary in other countries that operate under more stringently managed systems. The limited influence of time on HP is encouraging, but it also reveals other challenges related to diverse sectors, healthcare policies, and future practices. For instance, in the private sector, where patients pay for each visit, they may resist follow-up visits due to financial concerns. On the other hand, in the public sector, where services are often free or subsidised, follow-up visits may be constrained by workload and limited contact time per visit [26].

4.4. Implications for Practice

4.4.1. Clinical

The current HP practice and the PTs' confidence level in Cameroon highlight the need for evidence-based training to design effective interventions and support behaviour change. Advice alone is insufficient for sustained behaviour change, indicating a shift towards health coaching practices [16]. Effective HP acknowledges patients as experts in their situation, with PTs acting as coaches to instil purpose and confidence [54].

This study demonstrates the complex skill set that is required by PTs to address the multifactorial needs of pwCVDs by identifying different areas of awareness and factors affecting HP practice. These are necessary to provide patient-centred approaches and personalised interventions tailored to individual needs. PTs must appreciate the nuanced ways in which these risk factors affect patients with CVDs, necessitating personalised interventions for optimal outcomes. In line with the global call for PTs to address the increasing global burden of CNCDs [19,20], PTs are challenged to address several risk factors. The World Health Professions Alliance provides resources such as the Health Improvement Card, which can be used to assess and monitor risk factors for pwCVDs [55].

4.4.2. Educational

The findings reveal that PTs conduct HP activities but lack confidence across multiple domains. Cameroonian PTs may need more knowledge or confidence in utilising behaviour change techniques to address lifestyle conditions for pwCVDs. This highlights the need for formal training at entry level into practice and continuous professional development training on HP and behaviour change techniques to effectively equip PTs with the requisite

skills and knowledge to address lifestyle-related issues [43,48]. In line with existing evidence and ecological models, efforts should focus on strengthening individual factors and professional beliefs among PTs to positively impact healthcare [21].

4.4.3. Policy

The findings offer valuable insights for the development and implementation of PLHP initiatives not only in Cameroon but also in similar settings in Africa. They underscore the importance of curriculum development that integrates HP strategies to equip PTs to address the CVD pandemic. Entry-level physiotherapy programmes in Cameroon should be assessed to ensure they equip graduates with the skills to address emerging healthcare needs, such as promoting health and preventing illnesses, especially among pwCVDs. The government should invest in producing evidence-based public and clinical guidelines in Cameroon.

4.5. Strengths and Limitations

Strengths include the use of a rigorously developed and validated survey instrument, the use of ecological levels to investigate factors affecting HP practice holistically, the large number of respondents, and the use of recommended guidelines in the conduct and reporting of this study.

The study faced challenges with the representativeness of its sample, which makes generalising the findings difficult. This was mitigated by recruiting a large sample of practising PTs, estimated at 250–400 [29,30]. Secondly, respondent bias is possible, as individuals who completed the survey may have a heightened interest in HP activities [56]. This bias could skew the findings and may not accurately represent the broader population of PTs in Cameroon. Thirdly, the sample was not specific to PTs who manage pwCVDs. PTs with much lower caseloads of pwCVDs may face different realities in their practice, so findings should be considered cautiously. Fourthly, we examine potential factors affecting several components of HP without any solid association with PLHP practice; future studies should examine barriers and facilitators to specific components of PLHP in Cameroon. Finally, while the study utilised a validated survey tool, the reliance on quantitative research methods with closed-ended questions may limit the depth of insights into PTs' beliefs, attitudes, and perceptions regarding HP for pwCVDs. This limitation underscores the need for complementary qualitative research to explore these aspects comprehensively.

5. Conclusions

Cameroonian PTs reported high levels of practice in some HP activities with consistently lower confidence levels in delivering all activities for pwCVDs. Most respondents delivered HP advice verbally, seldom using print or written advice. Professional beliefs, confidence in interventions, supportive teams, and favourable working conditions potentially enhance HP practice. This highlights the necessity of strong organisational and professional support. However, entrenched beliefs in using passive modalities, patient adherence issues, and systemic challenges, including lack of resources, guidelines, role ambiguity, and limited training opportunities, may limit HP practice.

This study demonstrates the complex skill set that PTs require to effectively address the multifactorial needs of pwCVDs by identifying different areas, awareness, and factors affecting HP practice. In line with existing evidence and ecological models, efforts should focus on strengthening individual factors and professional beliefs among PTs to positively impact the broader healthcare ecosystem. This highlights the importance of curriculum development integrating HP strategies to equip PTs to address the CVD pandemic. Our quantitative research methods with closed-ended questions may limit the depth of insights into Cameroonian PTs' beliefs, attitudes, and perceptions regarding HP for pwCVDs. This limitation underscores the need for complementary qualitative research to gain an in-depth understanding of HP practices in Cameroon.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/clinpract14050140/s1, Table S1: A Do you ask your patients about their confidence to change or improve their habits in the following areas? B Do you discuss challenges patients may face while trying to improve in any of the following areas? C Do you assist your patient to know the optimal recommended values for? What is most (highest) common type of problems your see on daily basis?—Selected Choice.

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4.3. Supplementary Information

This section includes a more detailed exploration of salient points in this study.

These points were highlighted in the published article, but word count limitations limited the discussion. Issues that warrant expansion and further discussion are;

- Use of personal lifestyle experiences to facilitate HP for patients
- Sampling, survey strategies and limitations.
- How the study informed the research programme.

4.3.1 Using Personal Lifestyle Experiences to Facilitate or Inform HP for pwCVD.

In the survey, 76% (n=131) of respondents agreed that they used their personal lifestyle experiences to inform and facilitate HP messaging for patients (Ngeh, McLean, Kuaban, Young, & Lidster, 2024). This approach is beneficial, especially as physiotherapists and healthcare providers are increasingly called upon to model positive health behaviours (Lobelo & De Quevedo, 2016). Evidence suggests that healthcare professionals (HCPs) who are physically active are more likely to encourage physical activity in their patients, serving as role models in health behaviour change (Lobelo & De Quevedo, 2016; Oberg & Frank, 2009).

However, relying on a personal lifestyle as a role model for patients has its limitations. Placing excessive emphasis on the healthcare professional's (HCP) personal experiences can unintentionally normalise the HCP's own challenges and constraints, potentially hindering the comprehensive application of evidence-based interventions. HCPs may unconsciously prioritise HP areas they excel in while neglecting or struggling to advise on behaviours they find challenging to change themselves. For example, Kyle and colleagues reported a 25.12% obesity prevalence among nurses in England, raising questions about the consistency of role modelling across health domains (Kyle et al., 2017). Grech and colleagues reported that HCPs who were smokers viewed tobacco cessation counselling and advising patients on smoking risks as not important to the hospital/service. Fewer smokers (HCPs) agreed to the statement 'I have an obligation to advise patients on the health risk associated with tobacco use' when compared to never smokers. Conversely, former smokers were more likely to disagree with 'it is difficult for me to get people to quit smoking' when compared to those who never smoked (Grech et al., 2020). Enhancing physiotherapists' understanding and use of evidence-based HP methods, alongside supporting their health behaviours, could yield benefits not only for physiotherapists but also for pwCVDs (Oberg & Frank, 2009; Sousa & Moor, 2023)

4.4.2 Sampling, Survey Strategy and Limitations

For practical considerations, this study employed a non-probability sampling approach, meaning not all individuals in the sampling frame had an equal chance of being selected (Feild et al., 2006; Sarker & AL-Muaalemi, 2022). Data collected using this method is therefore limited to describing, explaining, or predicting information specific to those who participated in the survey, making the findings applicable only to the sample. In the published article, it was clearly noted that the results should be interpreted with caution and are not necessarily generalisable. A significant limitation of this non-random sampling strategy is the potential overrepresentation of individuals interested in the topic, introducing a sampling bias (Burke & Hodgins, 2015). However, random sampling is rarely feasible in healthcare research due to various constraints (Burke & Hodgins, 2015). The decision to use a non-probability sample in this study was due to a lack of accessible data and an inability to define the entire physiotherapy population. Sampling bias was minimised by recruiting approximately more than half (n=181) of practising physiotherapists in Cameroon. Current data report between 250 to 400 practicing physiotherapists (Kossi, 2023; Sharma, 2022). While physiotherapists must register with the Cameroon Society of Physiotherapy (CASP), less than a third of survey respondents were fully registered, and comprehensive data on those practising in private and public sectors was unavailable, making random sampling and accurate comparisons difficult.

Surveys are prone to response bias, which occurs when respondents provide inaccurate or misleading answers, potentially compromising the validity of the results (Bogner & Landrock, 2016). Common forms of response bias include social desirability bias, where respondents give answers, they believe are socially acceptable rather than truthful, and acquiescence bias, where they tend to agree with statements regardless of their content. Additionally, question order and framing can influence responses. A carefully designed survey was implemented to reduce response bias, featuring neutrally phrased questions, guaranteed anonymity, and strategies to encourage honest and accurate responses.

Research indicates a trend of declining response rates in healthcare surveys (VanGeest et al., 2007; VanGeest & Johnson, 2011). Several strategies were implemented to enhance survey participation. According to leverage-salience theory, the perceived relevance of a topic strongly influences response rates (Groves et al., 2000), a concept widely supported in the literature (Peytchev et al., 2009). The association with respected physiotherapists and services in Cameroon helped enhance its perceived importance, which, in turn, encouraged organisational support and raised awareness among potential respondents. Given that lack of time is a common barrier to survey completion (Burke & Hodgins,

2015; Peytchev et al., 2009), efforts were made to keep the survey brief for the convenience of busy clinicians. Studies suggest that public endorsement and visibility can help boost response rates by appealing to professional camaraderie (Peytchev et al., 2009). Thus, contemporary media channels and professional physiotherapy groups were instrumental in disseminating the survey, reminders, and mentions at relevant meetings and workshops. Lastly, altruistic motivations and beliefs in the survey's potential benefit to the profession and patient care were emphasised in the introduction, which is known to positively influence healthcare professionals' willingness to participate (Clark et al., 2014).

4.4.3 Implications for Practice, Education and Policy

The finding that physiotherapists engage in HP across multiple areas is promising, indicating the potential to enhance HP practices for pwCVDs. Physiotherapists reported confidence in delivering HP in several areas, although confidence was lower in specific areas such as alcohol use and sleep interventions. This finding presents an important opportunity for further exploration with practice, education and policy implications.

4.4.3. 1 Implications for Practice

Improving the understanding of the vital role physiotherapists play in CVD prevention and management is crucial, particularly in lifestyle counselling, exercise prescription, and patient education. For Cameroonian physiotherapists to effectively fulfil this role, they must thoroughly understand CVD, its risk factors, and the corresponding interventions. Recognising CVD as a condition influenced by various lifestyle factors—and understanding how to address these factors beyond exercise and physical activity—is essential. A deep understanding of these elements within the Cameroonian context, including the underlying drivers, can guide the development of feasible, culturally appropriate, and impactful interventions tailored to the local population (Jordan et al., 2019; Movsisyan et al., 2019). The limited availability and accessibility of clinical and public health guidelines for CVD or NCDs in general negatively impacts HP efforts for individuals with CVD. Developing and implementing standardised guidelines for PLHP tailored to the Cameroonian healthcare system is essential to streamline efforts and enhance outcomes. Evidence-based guidelines have the potential to standardise practices, lower costs, and improve the overall quality of care provided (Guerra-Farfan et al., 2022; Woolf et al., 1999). Enhancing the capacity of physiotherapists in Cameroon is crucial for improving the quality of lifestyle interventions for pwCVD. Regular workshops and continuous professional development (CPD) training programmes are vital for building

and sustaining capacity across various HP components. Effective support is essential to facilitate the integration of these trainings into clinical practice, requiring strong collaboration with relevant stakeholders. It is imperative for physiotherapists and stakeholders to recognise that while change necessitates resources, it ultimately enhances the quality of care. Stakeholders, including the Cameroon Association of Sports Physiotherapy (CASP), the Ministry of Public Health, and hospital administrations, should be educated about recent advancements and the importance of adopting evidence-based approaches in practice.

A study by Muntesu and colleagues revealed that only about a quarter of Cameroonian physiotherapists are familiar with evidence-based practice (EBP), with no significant differences observed based on educational qualifications (Muntessu et al., 2024). This limited understanding may hinder proper comprehension of the complexity of risk factors and lead to underutilisation of objective and patient-oriented outcome measures in clinical settings (Eversole et al., 2021; Kyte et al., 2015; Naqvi et al., 2023). Outcome measures are integral for assessing a patient's clinical status, guiding treatment decisions, monitoring progress, and potentially shaping future research directions (Eversole et al., 2021; Kyte et al., 2015; Naqvi et al., 2023). Their effective implementation in practice can significantly enhance the quality and efficacy of physiotherapy interventions.

4.4.3.2 Implications for Education

The survey findings underscore the urgent need to modernise the physiotherapy curriculum in Cameroon to address the evolving demands of the profession. With a growing number of pwCVD, physiotherapists are increasingly encountering patients with lifestyle-related conditions. This aligns with the declarations of physiotherapy summits on global health, which have identified NCDs as a critical professional priority (Dean, 2009).

Given the changing epidemiology, physiotherapists must adapt their skills, beginning with entry-level training. An outdated curriculum significantly hinders their ability to deliver optimal care (Muntessu et al., 2024). This perspective echoes recommendations from the third physiotherapy summit, which emphasised the need for health competency standards to ensure consistent HP and NCD prevention practices across world physiotherapy regions (Dean et al., 2019). The authors highlighted the importance of equipping physiotherapists with specific competencies, such as effective counselling on smoking cessation, basic nutrition, weight management, reducing sedentary behaviour, and promoting increased physical activity and exercise, regardless of the patient's

presenting condition. Integrating these components into the training curriculum in Cameroon is essential to align practice with contemporary global standards and to improve the quality of care.

4.4.3.3 Implications for Policy

Physiotherapists in Cameroon can play a pivotal role in HP by engaging in advocacy, raising awareness, fostering collaboration, and enhancing professional capacity. Integrating physiotherapists into national policies and frameworks for CVD prevention and management is essential. Collaboration with stakeholders, such as the Ministry of Public Health, and active participation in advocacy campaigns through platforms like the Cameroon Society of Physiotherapy (CASP) are crucial steps. Physiotherapists should also contribute to developing guidelines and standards for NCD prevention and HP.

Resource allocation is critical for creating sustainable programmes addressing lifestyle-related conditions. Policies must prioritise funding and infrastructure, such as Parcours Vita, currently available in only 5 of Cameroon's ten regions. Adequate sensitisation and building more green spaces (Parcours Vita) that promote and safeguard the rights of all people of all ages and genders may enhance equitable access to safe environments in their cities and communities (Tatah et al., 2021). Access to regular exercise and physical activity can positively influence the CVD burden in Cameroon.

Public awareness campaigns and media engagement are critical to highlight physiotherapy's role in addressing lifestyle-related health issues. Community-based initiatives and partnerships with NGOs and local funders including mobile communication companies such Orange and MTN Cameroon can expand physiotherapy services to underserved communities.

4.4.4 Chapter Summary and Implications for Thesis

This chapter presented a peer-reviewed article (Study 2) addressing the second research programme objective (To examine current physiotherapy practice in health promotion for pwCVD in Cameroon). The article reports a high level of engagement in HP for pwCVD with lower confidence levels across all components by Cameroonian physiotherapists. Factors affecting the engagement in HP among physiotherapists were also reported. Further discussions on some of the findings, notably the use of personal lifestyle experiences among physiotherapists and other HCPs, were also discussed. The survey method and the associated limitations were also highlighted and discussed, as well as strategies used to mitigate them. The study's implications for practice, education, and

policy were also elaborated upon, with specific reference to the Cameroonian healthcare context. The next chapter further explores Cameroonian physiotherapists' practice, confidence, and perception of HP for pwCVD in a qualitative study (Study 3).

Chapter Five: Cameroonian Physiotherapists' Practice, Confidence and Perception of Health Promotion for People at Risk or With Cardiovascular Diseases: A Qualitative Study (Study 3).

5.1 Introduction

This chapter presents a qualitative primary study further exploring the practice, confidence and perceptions of physiotherapists on HP for pwCVD (Study 3) following the national cross-sectional survey (Study 2). The chapter starts with contributions and links between studies 2 and 3. This qualitative study addressed the fourth objective of the research programme: To investigate the competence and confidence of Cameroonian physiotherapists in delivering HP for pwCVD. This is the second primary study among physiotherapists in Cameroon from the research programme. It opens with an overview of the study's context, and the complete manuscript is included as a preprint. The qualitative study provided a more in-depth explanation and provided context to the quantitative findings. The strengths and limitations of the qualitative design are then discussed. The implications of findings on practice and training are also explored.

The qualitative study was submitted to an international journal of physical therapy (*Physiotherapy Theory and Practice*) and is pending a decision at the time of submission of this thesis.

5.2 How the Quantitative Findings (Study 2) Informed Qualitative (Study 3)

Study 2 informed study 3 in three ways: i) informed the priority areas of HP practice to consider in studies 3 and 4, ii) informed the development of a topic guide for study 3, iii) guided the recruitment of participants in study 3.

5.2.1 Priority Areas of HP Practice to Consider in Study 3.

The scoping review (Study 1) provided the scope of HP practice globally among physiotherapists with respect to pwCVDs (Ngeh et al., 2023), informing the development of the survey instrument for study 2 (Ngeh, McLean, Kuaban, Young, & Lidster, 2024). The findings of Study 2 highlight priority areas of engagement in practice, including physical activity, exercise, dietary advice, smoking cessation, weight and stress management, and counselling (Ngeh, McLean, Kuaban, Young, & Lidster, 2024). This

provided preliminary guidance for the research programme of areas to consider among pwCVDs.

5.2.2 Informing the Development of the Topic Guide

Table 5: How the key findings from Study 2 informed the topic guide for Study 3 (see Supplementary file S1, Study 3). These were developed into a topic guide

Key Quantitative findings	Development of Qualitative Questions
Physiotherapists providing HP advice for pwCVDs across several components.	Do you practice health promotion to enable patients to improve or increase control over their condition or risk factors that can lead to CVD? • Frequently or rarely? • Specific components of health promotion? Please tell me more about which areas of health promotion in practice you feel comfortable engaging your patients in. • Exercise and physical activity • Diet/nutrition • Alcohol, smoking and sleep counselling?
46-61% of the respondents reported addressing challenges pwCVDs may face across several components.	Do you generally assist patients with strategies to adopt and maintain new habits? If yes, what are some of the habits and strategies? • Which components? Do you generally discuss challenges patients may face while trying to improve in any areas? If so, can you give me some practical examples of doing this? • Resources • Providing the best evidence and options Are there any theories or concepts you employ when guiding you to assess your patient's willingness to engage in proposed changes? • Adopted pattern for routine practice Specific techniques Do you generally assist your patient to know the optimal recommended values or best practice guide for any area of intervention you propose? Which sources do you use for this information? • Physical activity • Sleep • Alcohol • Weight
Several factors influencing HP practice were identified at the intrapersonal, interpersonal institutional and community levels	Where you work, are there any barriers which make health promotion difficult? • Individual (knowledge, training, time …) • Environmental (resources, space…) • Institutional (guidelines, collaborators, mentors...) • Systematic (National and international guidelines…)
The majority of physiotherapists reported being confident in assessing lifestyle elements such as	How competent are you in delivering health promotion activities for pwCVDs?

weight management and alcohol use and slightly confident or lacking confidence in undertaking HP activities involving sleep and diet.	• Understanding of what to do in each case based on your training/knowledge To what extent do you feel competent at delivering health promotion activities for pwCVDs? • Confidence How did you gain such competence? • During training • Clinical placement • CPDs Are you aware of cognitive behavioural interventions, strategies, and therapists? If yes, please tell me more about how you employ that in health promotion practice. • Theory to aid in behaviour change • Specific strategies Are you comfortable assessing lifestyle and behaviour changes for a patient? If so, can you give me some practical examples of doing this? • Specific outcomes measures • What you do in routine practice

5.2.3 Guide for the Recruitment of Participants in Study 3.

Participants for Study 3 were drawn from respondents who completed Study 2 and indicated interest in further participation. Individuals who met the purposive sampling criteria and were available for semi-structured interviews were invited to participate. Only those who had completed Study 2 were eligible for inclusion in Study 3.

5.3 Complete Manuscript as Preprint (Study 3)

Study 3 is reproduced here, with the publisher's permission, in the format that it was published online as a preprint (pending publication decision at the time of submission of this thesis).

Article

Cameroonian Physiotherapist's Practice, Confidence and Perception of Health Promotion for People at Risk or With Cardiovascular Diseases: A Qualitative Study

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Abstract: Background: Cardiovascular diseases (CVDs) and their risk factors are increasing with associated disability and mortality burden globally especially in low- and middle-income countries including Cameroon. Physiotherapist-led health promotion (PLHP) interventions provide opportunities to improve health and reduce this burden. Understanding the practice, confidence and perception of physiotherapists is crucial for designing effective, context specific PLHP interventions. **Methods:** This qualitative study explored practice, perceptions, and confidence of physiotherapists in delivering PLHP to pwCVDs in Cameroon. **Results:** Sixteen participants completed the interviews and analyses of the transcripts generated three main themes which included 1) Perception of Physiotherapists' role in health promotion (HP), 2) Current practice of PLHP 3) Competence in delivery of PLHP. Physiotherapists believe that it is within their professional role to deliver HP interventions in practice. Current HP practice was limited to exercise, physical activity and dietary/nutritional interventions. Participants reported lack of knowledge and formal training in PLHP delivery. **Conclusion:** Despite strong interest in HP, HP practice among physiotherapists is limited in scope, under resourced and limited by a lack of confidence in the delivery of behavior change interventions. These findings are relevant for the design of appropriate clinical training and policies for care of pwCVDs.

Keywords: Physiotherapy; health promotion; cardiovascular diseases; risk factors; Cameroon

1. Introduction

The global burden of non-communicable diseases (NCDs) has resulted in increasing numbers of people at risk or with cardiovascular diseases (pwCVDs)[1–3]. NCDs have emerged as a major public and clinical problem globally, particularly in Cameroon, with increased annual mortality burden from 27.4% in 2000 to 37.7% in 2019 [4,5]. The prevalence of hypertension ranges from 19.8% in rural areas [6] to 47.5% in urban milieu with a national average of 31.0% [7]. Hypertension accounts for 41.3-54.5% of diagnosed CVD cases in Cameroon [8,9]. The incidence of stroke is increasing (2.5% in 1999-2000 to 13.1% in 2011-2012), with case fatality increasing from 14.4% to 22.4% over the same decade [10]. In one hospital-based study in Cameroon, CVDs accounted for 10-16% of all hospital admissions, with heart failure (38.5%) and stroke (33.3%) making up the bulk of these admissions [8]. In 2012, 12% of Cameroonian deaths were attributed to CVD [11]. The prevalences of diabetes [12], hypercholesteremia [13], tobacco use and overweight/obesity [14] are high relative to regional and global figures [13]. It is necessary to curb the growing prevalence of pwCVDs, premature deaths, long-term disabilities, hospitalisations, and rehabilitation costs [15–17], and reduce the growing burden on healthcare systems [18]. This has significant implications for practicing physiotherapists

in Cameroon. The primary roles of physiotherapists are to manage/treat diseases, promote health and prevent disability in individuals and the general population (26, 27). Physiotherapists use health education, direct interventions, research, advocacy, and collaborative consultations in fulfilling these roles [21]. In some countries, physiotherapists are expected to advocate for primary health principles, including diet, rest, exercise, weight control, tobacco cessation, immunizations, avoidance of infectious and contagious diseases, skin care, dental hygiene, and sanitation [22].

It is well established that NCDs are associated with an unhealthy lifestyle, suggesting lifestyle changes could reduce NCD burdens significantly [1,23]. HP programs targeting lifestyle changes have been effective at reducing blood pressure, increasing physical activity uptake and improving health behaviors in various populations [24–27]. These HP programs typically include counselling, behavioral change advice, and specialist referrals for personalized care within healthcare settings [25]. A crucial aspect of effective health promotion is to Make Every Contact Count (MECC) where healthcare professionals use each patient interaction as an opportunity to encourage positive changes in health behaviour [28].

The Physiotherapy Summit on Global Health highlighted the need for physiotherapists to collaborate with other health practitioners to initiate and support interventions to combat NCDs using their unique skills and knowledge [22,29,30]. Given the prevalence of pwCVDs in Cameroon, strengthening Physiotherapist-Led Health Promotion (PLHP) is crucial for addressing the rising NCD burden [31]. Physiotherapists, with their frequent and extended patient interactions, are well-positioned to screen for and influence lifestyle behaviors that contribute to these lifestyle conditions [32]. An essential part of the PLHP strategy is health education [33]. It is essential for physiotherapists to possess the following four clinical communication competencies: know (has acquired theoretical knowledge and skills), know-how (knows how to apply these skills), show how (can competently demonstrate these skills on specific occasions), and do (can competently demonstrate these skills daily)[34,35]. Acquiring skills and competencies in wide range of HP activities is essential for physiotherapists to feel equipped to implement PLHP for pwCVDs [35].

PLHP faces challenges across various healthcare systems due to a focus on acute care in hospitals and a need for greater competence [36,37]. Barriers such as inadequate HP training, lack of confidence [38], skills gaps, time constraints, beliefs, reimbursement issues, and current workloads also hinder effective PLHP [39,40]. Despite the growing need for PLHP in Cameroon, it is unclear how physiotherapists are involved in HP clinically, policy or research. Therefore, the aim of this study was to explore physiotherapists' practice and perceptions of their role and confidence in delivering PLHP to pwCVDs in Cameroon.

2. Materials and Methods

2.1. Study Design

This study employed a qualitative design drawing from the interpretivist paradigm [41]. Interpretivism operates from the position that knowledge of reality and human action is a social construct and is interpreted by individuals [41]. The interpretative paradigm urges researchers to cultivate an empathic understanding by viewing the world from the participants' perspectives [42]. This paradigmatic approach was instrumental in guiding data collection methods, concentrating on physiotherapists' views regarding their practice and role in health promotion. The Standards for Reporting Qualitative Research was adopted for the conduct and reporting of this study [43].

2.2. Study Area

This study was conducted among physiotherapists practicing in Cameroon [44]. Physiotherapists work in various settings, including private clinics/cabinets, public and private (religious) hospitals, military hospitals, sports clubs, or teaching in higher education institutions. These physiotherapists prescribe physical activity and exercise as well as advice on several components of health promotion to manage pwCVDs [45]. Most physiotherapists are concentrated in urban areas, with limited physiotherapy services delivery in rural areas [46].

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2.3:. Participants

Sixteen physiotherapists were purposively recruited from the sample that participated in our previous study (45). Inclusion criteria were i) physiotherapists practising in Cameroon for at least one year, ii) physiotherapists with at least two years of physiotherapy training and iii) providing consent to participate. Forty-three physiotherapists provided their preliminary consent to participate in the interview during an online survey [45]. Sixteen of these were purposefully recruited based on age, gender, the highest level of training, working experience and location of the practice. This approach was used to achieve a cross section of the sample that could offer deep insight based on their practice as physiotherapists [47]. Written informed consent was obtained from all participants prior to participating in interviews.

2.4:. Interview Procedure and Data Collection

In accordance with an interpretive paradigm, a semi-structured interview guide was developed, with open-ended questions to explore participants' current practice, perspectives of their role and confidence in delivering PLHP to pwCVDs in Cameroon (Supplementary file S1). Permission to record the interview was obtained from all consenting participants to ensure the accuracy of the resulting transcripts [48]. The investigator used general familiarization questions specific to the physiotherapy practice to build rapport in the presence of the audio recording device before addressing all central questions [49]. Subsequently, the discussion moved on to their practice, confidence and perceptions of their role in PLHP delivery. Interview recordings were transcribed, including verbal expressions and body language that reveal considerable emotions or feelings on specific issues [50]. A field diary based on comments and explanations of description and interpretation of context-specific slang or jargon was kept. All interviews were conducted face-to-face by the lead author (E.N.N), mainly in the clinical settings of the participants between the 5th of February and the 1st of March 2024. Interviews lasted between 18 and 60 minutes with a mean duration of 34 minutes. All interviews were audio-recorded and transcribed. By comparing interview data throughout the analytical process and observing that no new aspects, dimensions, or nuances of codes emerged, we concluded that data saturation had been achieved [51].

2.5:. Data Analysis

Thematic content analysis was conducted using NVIVO 12 [52,53]. The six-step thematic approach was used in the first stage, as recommended by Braun and Clarke [54]. The results of the early interviews were used to develop common categories and subcategories, and some previously defined categories were clarified with further analysis. Each category was supported with a quote from an interview transcript. The authors (E.N.N and B.S) compared each new topic with previous transcripts whenever it was brought up. As a result, the general categorization was able to evolve until the end of the analysis (data saturation) [54]. Following the individual analysis of each interview, two researchers (ENN and BS) conducted a joint analysis. ENN is a physiotherapist and lecturer, and BS is a qualitative researcher in sport and exercise science. The researchers were cognizant of their own diverse personal and professional viewpoints and experiences, some of which were considered to result from having insider status within the physiotherapy community. Although these opinions and experiences could have impacted the analysis [55], the authors were aware of the need to set aside their views and focus on the exploration about the study aims. Any discrepancies or additional ideas were discussed to agreement and/or included in the findings. To enhance the credibility and trustworthiness of the work, the final findings were reviewed and refined by two experienced qualitative (RY and JL) and quantitative (SM and CK) co-investigators. The experienced researchers confirmed that the analysis was credible and that themes were rooted in the data. A qualitative research report was prepared using guidelines for reporting qualitative findings [43].

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3. Results

3.1. Participants Characteristics

A total of 16 physiotherapists, aged between 30 and 63 years, participated in the semi-structured interviews. Table 1 presents detailed characteristics of the study participants.

Table 1. Characteristics of physiotherapists who participated in qualitative interviews (n=16).

SN.	AGE	QUALIFICATION	EMPLOYMENT TYPE	WORKING EXPERIENCE	Sector
P1	30	MSc.	Clinician/Academic	4 Years	Private
P2	34	MSc.	Clinician	6 years	Public
P3	40	BSc.	Clinician/Academic	13 years	Private
P4	61	BSc.	Clinician/Academic	33 years	Retired (Public/Private)
P5	46	BSc.	Clinician	17 years	Mission (Catholic facility)
P6	37	BSc.	clinician	4 years	Private
P7	36	BSc.	Clinician	8 years	Public
P8	42	HND	Clinician	10 years	Private
P9	63	HND	Clinician	36 years	Retired (public/private)
P10	33	HND	Clinician	9 years	Private
P11	38	BSc.	Clinician	13 years	Public
P12	32	BSc.	Clinician	4 years	Private
P13	43	MSc.	Clinician/Academic	12 years	Public/Private
P14	33	MSc,	Clinician/Academic	6 years	Private
P15	40	BSc.	Clinician	10 years	Public
P16	38	HND	Clinician	11 Years	Public/private

* P: Participants, HND: Higher National Diploma, BSc.: Bachelor of Science, MSc.: Master of Science.

3.2:. Qualitative Findings

Analyses of the transcripts generated 23 lower-order themes, 7 higher-order themes and three main themes which included 1) Perception of Physiotherapists role in health promotion, 2) Current practice of PLHP 3) Confidence in delivery of PLHP, as presented in Table 2. Complete results can be found in the supplementary file Table S2.

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Table 2. Higher and lower order themes on the PLHP practice and perceptions among Cameroonian physiotherapists (n=16).

Dimensions	Higher order themes	Lower order themes
Perceptions of their roles in HP	Professional role of PTs	Scope of practice
		Prevention of diseases and disabilities
Current practice of PLHP	Areas of current practice	Assessing lifestyle
		Exercise and diet
		General advice and counselling
		Referrals and multidisciplinary collaboration
		Smoking, sleep and alcohol
	Delivery methods	Verbal discussion
		Group education or exercise
		Written or print out
	Training needs	Behaviour change approaches
		Basics on health education
		Assessing lifestyle behaviour
Confidence in delivering HP for pwCVDs	Level of confidence	Perceived as moderate
		Perceived as low
	Acquiring competence	During training and clinical experience
		Internet
		Seminars and workshops
		Books and publications
	Challenges	Workload and time
		Trainings
		Lack of resources
		Perceptions of patients

3.2.1. Theme 1: Perceptions of Their Roles in Health Promotion

All participants perceived HP to be well within the professional scope of physiotherapy practice. Some took the perspective that patients are less likely to know about their condition, and it is the fundamental and integral duty of physiotherapists to educate them.

"*As a physiotherapist, you go a long way to give more knowledge to the patients because most of the patients that come in … have less information concerning their conditions*" P7.

A few physiotherapists in the private sector embrace HP practice to provide a more comprehensive and attractive healthcare package for their patients. They believed that HP advice improves health outcomes, therefore providing a higher quality service for their clients. Hence HP is adopted and practiced in the private sector for business sustainability and reputation of physiotherapy practice.

"*It is important because the health promotion goes with the physiotherapy. You offer it because it's going to help people get more ... especially in the private practice, you need them to come back… to refer people… your service is better than the regular service anywhere else*" P6

Most of the participants perceived HP to be very valuable in the management and prevention of diseases including primary prevention (P13), secondary prevention (P6) and tertiary (P10). Participants perceived HP to be valuable beyond single patient health to provide family members with support to promote health and prevent diseases and disabilities that can keep them away from the hospital.

"*Yes, it's very important. It's not all about managing diseases but trying to get the patients and family to stay healthy and not frequent in the hospital with disabilities and diseases. So… is part of our practice in the public health in this country*" P13

Participants acknowledged that CVDs have multiple causes and risk factors, and it well within their scope to evaluate, monitor and provide advice on these risk factors to prevent relapse and complications due to these risk factors.

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"Yes, most patients that come here maybe post-stroke; we start by educating and monitoring certain biochemical processes in the system like cholesterol level and triglycerides because those are the risk factors that can lead to a second stroke, which is very dangerous. Advise most of the patients that there is a probability that having the second stroke is very possible" P6

Some of the participants perceived HP to be very valuable in maintaining long term health and not just for management of a condition within a clinical setting

"To me I think it's important because it will help to improve the health of the patient in the long term, not only at the clinic, but even after and also it would delay the occurrence of a new disease" P10.

Despite participants accepting that HP is within their professional role, there is some ambiguity with what constitutes the scope and standards of HP for some components such as nutrition, smoking, sleep and alcohol use that are perceived to be outside the traditional scope physiotherapy practice.

"But from my part, education is part of, but it becomes difficult when you enter another field which is not yours. Diet and nutrition are separate, so it is not easy for somebody, someone, to enter somebody's field. So, we just do what we can do to help the patient" P9.

3.2.2. Theme 2: Current Practice of PLHP for pwCVDs

Areas of Current Practice

Some participants assessed CVD risk factors in practice. This was limited and took differing forms among participants. Most of the participants reported no specific or objective assessment tool for HP components apart from weight measurement and the calculation of BMI.

"Absolutely, all patients that pass through the clinic we take their BMI of all the patients. We know the importance of obesity as a risk factor for cardiovascular diseases in the body" P4.

The majority of the participants used only therapeutic assessments and approaches in practice with no lifestyle screening as highlighted by P7.

"I follow the conventional way of assessing a patient as you start with the demographic data, past medical history and all of that. Once I go through that procedure. I established the diagnosis and then that's how I get to a conclusion on what the patient is suffering from", P7.

Some participants acknowledged delivering exercise and nutritional/dietary advice for patients in their practice more than any other components, with some expressing frequent engagement and confidence in delivering weight management advice. This was common across physiotherapists practicing in either public or private settings and reiterated by those involved in training of physiotherapists.

"So, we advise patients a lot on exercises and on diets. Because if you see the world today, many patients end up becoming overweight or hypertensive at a very young age. So, to avoid that, we advise patients a lot on their diet and regular exercises" P1.

While current practice tends to focus primarily on exercise, nutritional/dietary and weight management interventions, the content and quality of these interventions were difficult to ascertain as no specific or objective measures were mentioned. The majority of the participants acknowledged assuming a counselling role in their practice to address a range of health issues. This was observed across lifestyle components, medical risk factors as well as stress-related concerns from participants in practice and providing training.

"With blood pressure, for example, at any time the patient visits, the blood pressure is taken. If it's too high compared to the last time, then we need to sit the patient down and talk, what is happening? Why has your blood pressure gone up? What changed from the last time? How has your diet been? With all of that we can understand how to better manage the patient" P1.

While participants in the private sector tend to adopt a routine approach, those in the public tend to assume a general counselling role across multiple components of HP.

"But the area that sometimes I feel comfortable with patients is mostly when counseling them, especially a patient with severe pain, I know that what I'm doing is just one-third of what can be done to help the patient. So sometimes I educate patients on positions that aggravate and relieve their pains. Sometimes I educate them, but I do lay emphasis on nutrition" P11.

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Participants acknowledged the role of other health experts and engaged in appropriate referrals when they perceived they are limited in delivering relevant HP interventions such as nutritional issues. The referrals process and HP practice were not influenced by the participants' qualifications, but rather by the availability of experts and the participants' length of service.

"*If patient ask me, information about nutrition, generally I will give to the patient basic knowledge. But when they want deep knowledge, I'll send them to a nutritionist. That's what I do, when the patients tell me, for instance, that I'm not sleeping, I will ask why? Are you stressed up, are you eating very well? But I'll send it to a nutritionist for checking*", P10.

However, beyond referrals, there was no evidence of meaningful collaboration and synergy with other clinicians to maintain high quality care in routine practice. Different healthcare providers have a role to play as highlighted by P10.

"*Yes, …is supposed to be a holistic care. We all have a part to play, so it's not one person. I'll be giving health promotion with respect to aspects that might be related to physiotherapy and nurses will have theirs with respect to hygiene and sanitation. The doctors have theirs with respect to medications and all of that. So, all together if we can put our heads, hand in gloves, then we are going to help the patients better. It's important that all medical personnel work together in every aspect of a particular disease, for example, diabetes and all of that, to get to give the best of care to the patients*" P10.

Some physiotherapists mentioned the importance of stress and lack of sleep, and their potential impact on health and behaviour. However, most of the participants acknowledged little to no delivery of HP interventions around sleep, alcohol use and smoking. Most physiotherapists pay little attention irrespective of level of competence to these areas as they perceive the majority of the patients not to be honest about these components in some cases (P5).

"*For example, the one that are very stressed by the work, normally those persons are not sleeping. They don't sleep, they sleep very late, and they get up very early and those habits have effects on their health and the ability to act well or to respond well. When you don't sleep well, you are very, very sensitive to many things around you*", P12.

"*… the answer is no because a lot of people will not be honest about that. They are not always open about alcohol consumption. They are not honest about smoking*", P5

Delivery Methods

Participants engaging in HP delivered it through different formats and expressed different reasons for adopting preferred methods in some cases. The majority delivered promotional and preventive interventions verbally due to the limited availability of working space and promotional materials. Where participants have interest to explore alternative delivery methods, they may also be limited by skills and resources to implement in routine practice.

"*I can say that the reason why I'm doing it always verbally is because I don't have the time to just write it, and to print it on papers, to help others. We know that it's not everybody that always likes to read. I can say that my brothers and sisters copied those habits, and they don't read. I'm not saying that is the reason why I'm not doing it*" P12

"*I talk individually because first of all, I don't have space to keep them to talk in group*", P6.

Despite the dominant use of one-to-one approach a few of the participants were aware of the benefits of group discussion and approaches to addressing health promotion issues. Sharing lived experiences during group discussions by patients was noted as a potential source of knowledge and motivation for other patients

"*The truth is that when you do it in a group, it has more effect than when you do it individually, because in group people can share their experiences, and then it helped them to really change. When you do it individually, the person might listen. But at the end of the day, they don't have the courage to follow up the advice*" P15.

Training Needs

Participants expressed significant gaps in basic knowledge and concepts around HP, making it difficult to deliver effectively.

"*Now, I know that I also have to learn more and do better as far as health promotion is concerned, because I never thought of it as something I really have to take serious*", P15.

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"Time is not a barrier, but I only use my basic knowledge to educate patients. I do not have any document or support that I can use", P16.

While knowledge is not enough to drive behavior change among patient groups, participants expressed and demonstrated a significant gap in using any behavior change approaches or theories relevant to HP and physiotherapy practice. Participants could not reference any behavior change strategy or model.

"I am not aware of any specific, cognitive or behavioral intervention, but I've implemented some behavioral changes. For instance, if you want to lose weight, don't eat too many meals in a day, eat at a given time in a day. If you say you eat 2 times a day, don't eat between those 2 times, don't eat too late. At night, if you know you're about to sleep at 9 or 10 pm, try to take your last meal around 6:00 pm, you make that persistent. But now about a particular cognitive behavioral pattern. I don't yet know about that" P14

Also, participants demonstrated a substantial gap with objective assessment and monitoring of lifestyle factors in practice with no objective or outcome measure tool mentioned. It is difficult to change an outcome if it is not well assessed and understood.

"For lifestyle just by asking their usual habits is the main way for me to assess it. And also, for behavior change, no, I don't really assess the behavioral change. I don't have the skills to assess that" P3.

3.2.3. Confidence in Delivering HP for pwCVDs

Level of Confidence

Some participants expressed a good level of confidence for limited components such as exercise, physical activity and stress management principally those engaging in training and teaching.

"I am more confident, mostly in physical activity. Yes, stress management that's counseling. I try to do counseling as much as possible" P2.

By contrast some participants reported poor confidence in delivering across components of HP such as alcohol use, sleep and smoking cessation among others.

*"But the other aspects, I don't feel so competent, so I tried to limit myself "*P11.

Acquiring Competence

The majority of the participants acknowledged gaining their knowledge and skills after formal physiotherapy training and through clinical exposure. Gaining more clinical experience was seen as the main way of building confidence and competence. Confidence in delivering advice was more associated with work experience than academic qualifications.

"Yes, I think that came around with the experience after so many years of dealing with people with these different conditions. You end up educating yourself or taking a course, and you improve these aspects because there are things you meet every day" P6.

Some participants gained confidence through reading and watching online content on HP. In some services, seminars and workshops have been sources of knowledge to improve competence among participants. However, these workshops and seminars are not offered regularly at either institutional or national levels. Some participants acquired the necessary knowledge on HP principally from books and published articles.

I walk a lot with this Physio-works, Physiopedia and some online physiotherapy groups and so most information we are getting is usually from there online, P6.

"Yes, ideally, we used to organize scientific meetings with presentations, but each department presents only once a year. So, when others are presenting, you learn as well when you're presenting, they learn as well from you" P15.

"Concerning diet, I had a book here called revolution des etudes du docteursArcaves an American. I used to explain to patients how to manage their weight and at times I give them my own personal experience, because formerly I was a diabetic patient with the diet I had. Now I'm no more taking diabetic drugs" P9.

Challenges

Workload and limited time were intertwined factors that affected participants' ability to provide HP intervention for both individual and group approaches. This was further influenced by the number of physiotherapists in the services, and patient availability for such education.

"*… sometimes that time to really sit and interact with the patient and the family, sometimes it's difficult, but sometimes we just prioritize the treatment of the patient*" P11

Some participants think that workload and time are not the major challenge to HP by comparison with the lack of necessary skills to deliver effectively on HP components.

"*Time is not a barrier, but I only use my basic knowledge to educate patients. I do not have any document or support that I can use*" P16.

Participants acknowledged limited training opportunities from entry level training, institutional and limited continuous professional development courses around HP.

"*As a physiotherapist, I will not say that it's has been really too much part of my formation or my training*" P5.

"*Yes, the national society does contribute. And the problem is it (HP training and courses) happens rarely. It can be like once annually mostly towards world physiotherapy day when you have celebrations. Yes, but to say let's plant something it's very rare*", P1.

HP is further challenged by the lack of resources including local and national guidelines, limited infrastructure such as working space for physiotherapy services and human resources such as physiotherapists employed in each service. Limited resources are available for infectious diseases, not NCDs in general.

"*Yes, I think we have SOP that guides you to educate patients in some pathologies. SOPs for example any other thing apart from cardiovascular diseases. We have SOPs on how to counsel people with TB, HIV and all that on health promotion and other aspects of their lives. There are for different pathologists, but for cardiovascular disease, specifically, I don't think I found one, but for these diseases that are under programs in the country, they have SOPs*" P13.

Participants reported that patients' views, values and perceptions sometimes challenge effective delivery of HP. Patients that are open, interactive and value the advice can facilitate the process of HP.

"*Now, some prefer their gender, if it is a man, the man, will prefer to talk to a man. If it is a woman, the woman we prefer to talk to the woman. If it's a mother, I think that they don't care if it is a man or a woman. When they are very aged, they don't care about the gender of the therapist they just pull out.*" P11

Participants reported challenges dealing with patients, but this could also be associated with the lack of skills to explore specific behaviors in a manner that is less invasive of privacy but illicit and strengthens motivation.

"*I don't know whether it's a cultural thing, but I look at it as it's not really my field, and it's kind of private when they open up, I'm ready. But if they do not open up, I don't poke. Yes*!" P5.

"*The patients have to trust you, before they can open up. I don't think I see that, and I can confirm that many of them, I can say all of them are not open*" P10.

4. Discussion

This is the first comprehensive qualitative study to explore the current practice, confidence, training needs, and perceptions of physiotherapists practicing in Cameroon regarding their role in HP for pwCVDs. Physiotherapists believe that it is within their professional role to deliver HP interventions to pwCVDs in practice. Despite strong interest in HP, reported implementation of it among physiotherapists appears to be limited by challenges associated with education, resources and confidence.

4.1. Perceptions of Physiotherapists' Role in HP

Participants perceived HP to be within their professional roles and scope of practice. This aligns with our previous survey on HP practices, where respondents reported implementing several HP components [45]. The HP advice tend to focus on exercise, physical activity and nutrition. Other components such as smoking, sleep and alcohol were perceived to be outside the traditional scope of physiotherapy practice. These findings are consistent with prior research among physiotherapists in the UK and Nigeria where HP practice focused on exercise and physical activity components of HP practice [36,56]. While exercise and physical activity are the very fabric of the physiotherapy

profession, perceptions towards other components are diverse and may be driven by contextual and prevalent risk factors. In addition to physical activity, Walkeden and colleagues in the UK found that their participants were more likely to promote smoking cessation but less likely to provide advice on alcohol use, weight loss or diet [36,45]. Beyond exercise and physical activity our participants provide dietary advice which may not be observed in Western context with adequate dieticians and nutritionists [57]. Provision of dietary advice in this study aligns with comparable studies from Africa (43,55). These differences could be due to context-specific realities and further defined by what physiotherapists perceive to pose greatest health risks. Limited attention on other risk factors such as sleep, alcohol use and smoking cessation may be attributed to poor understanding of the risk profile and the non-existence of experts in these areas in the Cameroonian context. There are high-profile calls for physiotherapy practice to be health-focused and for the scope to be broadened beyond exercise/physical activity to tackle the increasing NCD epidemic [29]. There is still ambivalence to embracing these calls by the physiotherapists in our study due to a lack of knowledge and understanding of other components such as smoking, sleep and alcohol to effectively engage in these components, and secondly, some physiotherapists feel that wider HP is not within their scope of practice.

4.2. Current Practice of PLHP for pwCVDs

This qualitative study followed a scoping review which revealed that physiotherapists globally engage in various HP activities including exercise/physical activity, diet, stress management, smoking, sleep and alcohol intake using diverse strategies [58]. This aligns with wider literature with physiotherapists providing HP advice beyond traditional exercise and physical activity [36,56,57]. In the present study, participants reported engaging in a range of HP activities, notably exercise/physical activity and dietary interventions. This is consistent with our previous survey in Cameroon [45]. However, our qualitative data showed inconsistencies in the approaches and interventions across different behaviors, similar to findings from the UK and Germany [36,59]. This was associated with the lack of a consistent framework, clear structure, or specific approaches and content to deliver HP. Conversely, Walkeden and colleagues reported higher engagement and consistency among older physiotherapists on HP [36]. This may be associated with long-term clinical exposure making them more confident to address behaviours. Consistency among older physiotherapists suggests confidence may be better developed with clinical exposures. Despite the availability of resources, training and specific competencies related to HP, it is necessary to consider approaches to build confidence among young physiotherapists to enhance their engagement in multiple components of HP in practice.

In this study, participants showed limited awareness and use of behavior change techniques across all HP components. They mostly provided general counseling without employing systematic approaches or specific techniques, such as goal setting, motivational interviewing or the 5A's (assess, advise, agree, assist, arrange) framework commonly used in primary care [39]. This is consistent with the findings from Germany where Eisele and colleagues identified only 17 behaviour change techniques (BCT) out of the 93 in the BCT taxonomy version one (BCTTv1) [59]. Contrarily, only 5 BCT were identified from our qualitative data. This may be due to the absence of guidelines and recommendations to support behaviour change intervention in the Cameroonian context. Globally, physiotherapists use a limited number of behavior change techniques, possibly due to lack of knowledge, experience, and perceptions of effectiveness [60].

Contrary to our quantitative data [45], qualitative data revealed severe lack of resources and training opportunities for PLHP in Cameroon. Participants also reported difficulties managing uncooperative or unmotivated patients, similar to challenges reported in Germany and the UK [36,59]. This has important clinical and research implications, as the best methods for engaging and motivating patients, particularly those with multiple conditions, remain unclear. The effective use of BCT and relevant resources are crucial, as prescription alone is insufficient to change behavior in chronic conditions [61]. Given the ineffectiveness of therapeutic approaches for lifestyle conditions, relevant knowledge and skills are necessary when dealing with lifestyle conditions [61]. It therefore

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necessary to promote the value of HP and the approaches that support better outcomes such as BCT as there is no evidence that it is easily understood and implemented by physiotherapists in daily practice. Entry level training programmes should incorporate HP and the evidence-based approaches that best support effective implementation.

4.3. Confidence in Delivering HP for pwCVDs

We report moderate confidence among the majority of participants, with some participants acknowledging the lack of confidence to deliver PLHP for pwCVDs either generally or on diet, sleep, alcohol, smoking and stress management. Our previous survey showed similar results, but the current study highlights training gaps in HP [45]. This aligns with findings from Nigeria, where only 20% of respondents felt confident and adequately equipped with HP skills [56]. The low percentages demonstrate that most physiotherapists gained confidence and competence during clinical practice rather than during entry-level training. Likewise, McLean and colleagues reported that healthcare students in England gained more confidence in areas with better training and clear referral processes [62]

It is only in the last decade that physiotherapy courses embedded public health interventions beyond exercise and physical activity, such as nutrition during physiotherapy training [63]. Findings from Ireland [64] demonstrate that, less than a third of physiotherapists had some form of formal training on promoting health through nutritional advice. It is worth noting that nutrition intervention and other behaviours and still gaining global acceptance into the physiotherapy scope of practice [30,57].

Our participants used diverse methods and approaches including the use of books, publications, workshops, seminars and internet with the use of social media in some cases to improve their competence and confidence to deliver HP. While diverse methods are welcome for different reason in practice, the lack of standardisation and competences in HP in training curriculum couple with the absence of continuous professional development opportunities on HP in Cameroon is concerning. There is a need to invest in standardisation and improved training opportunities both during entry-level training and clinical practice.

4.4. Acquiring Competence in HP Practice

Our participants identified significant PH training gaps. These includes poor awareness of behaviour change approaches and cognitive behavioural models and frameworks such as the trans-theoretical model of readiness to change health behaviour, motivational interviewing, decision balance analysis, and the 5 As endorsed by the WHO for individuals showing readiness to change. They also lacked basic knowledge of lifestyle components, such as healthy nutrition and alcohol intake, and did not utilize health assessment tools such as general and condition-specific tools, quality of life, life satisfaction and the health improvement card in practice. Without the awareness and the use of appropriate tools to deal with behaviour and lifestyle issues, it remains a matter of chance for physiotherapists to be objectively successful in HP. Despite the majority of our participants being compassionate about HP for pwCVDs, it's unknown how effective these HP interventions are in Cameroon and to what extent patients can transfer these habits beyond their acute physiotherapy sessions into their everyday life [65]. Similar gaps in formal HP training have been reported in Nigeria, where fewer than one-fifth of physiotherapists received training [56], and in Ireland, where many lacked training in areas like nutrition promotion [64]. Secondly, none of the participants reported using behaviour change models to support their counselling, which is concerning given the consensus that information alone is insufficient for behaviour change without intrinsic motivation [30,65]. Thirdly, participants were unaware of relevant assessment and outcome measurement tools, contributing to inconsistent practices and poor communication between physiotherapists and other clinicians. Addressing these gaps theoretically and practically may improve capacity to deliver HP with confidence and align with the global call to prioritise health-based competencies into practice and entry level education to effect multiple health behaviour changes to tackle the epidemic of NCDs [30]. Currently, there is no benchmark study on the content of the contemporary entry-level

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curriculum for physiotherapy training in Cameroon generally or based on content, training and skill competence on HP. Continuous professional education, institutional and self-learning opportunities have been ways to improve HP knowledge and skills however these opportunities are irregular. While continuous professional education offers some improvement, regular and formal training based on global principles, adapted to local needs through evidence-based approaches, is essential for improving HP outcomes [30].

Participants highlighted the lack of equipment and working alone as significant challenges. Consistent with prior findings in Nigeria, human and HP related resources were identified as major barriers [34]. Contrarily, a study in Germany by Eisele and colleagues identified patient-related factors, such as lack of enthusiasm for exercise and preference for passive treatments, as the primary barriers. These differences could be due the availability of human resources and infrastructures in Germany. This underscores the global call to expand the rehabilitation workforce, particularly in Africa, where the demand is seen as critical [66].

4.5. Implications of the Findings

There is a need for greater emphasis on public health and HP in the undergraduate physiotherapy curriculum. Coupled with a strong understanding of behaviour change theories and techniques, this would better equip graduating physiotherapists to effectively address lifestyle-related conditions within the Cameroonian context[30].

Relevant stakeholders including CASP, Ministry of Public Health, non-governmental organizations and policy makers should invest in evidence-based training opportunities for physiotherapists. CASP should develop and implement robust, continuing professional education opportunities in public health and HP for qualified physiotherapists leading to defined competencies with certification [30]. CASP should collaborate with the Ministry of Public Health to train and disseminate community health workers on NCDs prevention strategies. These community health workers may be able to disseminate information through local structures that may be more acceptable and accessible to the populace and in a language that can easily be understood. Expert patient groups and leaders are viable ways that may facilitate dissemination of public health messages on a large scale [67].

Moreover, physiotherapists in Cameroon must enhance collaboration with other healthcare professionals beyond patient referrals. While knowing when to refer patients is essential, it is equally important to establish communication pathways and systems that facilitate patient care and improve specific health outcomes [30].

4.6. Strengths and Limitations

Participants were drawn from over 10 collaborating health services across four regions of Cameroon which enhances the transferability and credibility of these findings. Aligned with a constructivist methodology, it is recognized that the researchers' preconceived ideas may have influenced the inquiry's design. To minimize bias, iterative reflexivity was utilized to acknowledge the primary researcher's role in shaping the data and analysis [68]. Data saturation was achieved before interviews were terminated, indicating that all salient concepts were likely identified.

5. Conclusion

In this qualitative study of 16 Cameroonian physiotherapists, participants reported that a broad range of HP practices falls within their scope of practice. They felt comfortable with recommending exercise, physical activity, and diet as key areas of HP under their purview. However, they felt less confident providing advice on smoking cessation, sleep hygiene, and alcohol use among others. Despite existing interest and engagement in HP, the data revealed a lack of awareness and application of behavior change strategies, limited understanding of core HP components, and an absence of objective assessment and monitoring tools for various conditions in clinical practice.

To address the growing issue of lifestyle-related conditions in Cameroon, physiotherapists must be better equipped to deliver HP effectively in clinical practice. This requires investment in creating a culture of HP that emphasizes evidence-based interventions. Stakeholders such as CASP and the Ministry of Public Health should organize mandatory training to improve competence and confidence in delivering all aspects of HP, ensuring standardization and the use of objective measures in clinical practice and beyond.

Supplementary Materials: The following supporting information can be downloaded at: Preprints.org, Table S1: Study Guide; Table S2: Complete Qualitative data with sample quotes.

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5.4 Supplementary Information

This section comprises a more detailed exploration of salient points that arose in this study. These points were highlighted in the published article, but the discussion was limited by word count limitations. Issues that warranted expansion and further discussion

- Qualitative study design, strengths and limitations
- How the study informed the research programme.

5.4.1 Qualitative Design, Strengths and Limitations

The use of qualitative design in this research programme offered several advantages and included an in-depth understanding of practice, confidence levels, and perceptions of physiotherapists regarding HP for pwCVD in Cameroon. The study provides context and culturally relevant insights into the role of physiotherapists, providing an opportunity to explore the challenges of PLHP, which might not be well captured by quantitative methods (Oranga & Matere, 2023; Rahman, 2016). The exploratory nature of the study allows physiotherapists to shed light on a niche area by articulating their thoughts and perspectives about HP for pwCVD without being constrained by predetermined survey options. This provided valuable insight to the quantitative data (Study 2). The added advantage of flexibility in data collection enables researchers to adapt questions or probes during data collection based on participants' responses. This flexibility ensures that unexpected themes or issues relevant to PLHP for pwCVD were captured.

Despite the overwhelming advantages of qualitative design using a semi-structured interview, the study also faced some practical challenges. These included subjectivity, bias, and challenges with validation. The findings of qualitative research are generally prone to subjective influences by the researchers' interpretations and the participants' subjective responses. The lack of standardised measurements increases the risk of bias in data collection and analysis. In this study, subjectivity and bias were minimised by three ways. First, the authors were actively reflexive by acknowledging and documenting their biases, assumptions, and influence on the study. Second, the data analysis was performed by two authors with different professional backgrounds. By arriving at similar results, the findings are rooted in qualitative methods. Third, the research team had two senior qualitative research methodologists who validated the findings. The insights gained in qualitative studies are generally limited to specific contexts. While findings may be applied only to the study's participants (Cameroonian physiotherapists) and not transferable to other populations or healthcare contexts, this limitation was minimised in two ways. First, detailed accounts of the context, participants, and findings were provided

to allow others to determine how the results may be applied in their settings. Secondly, the sample was purposefully recruited to cover different educational qualifications, gender, working experience, practice setting and region of practice.

Ensuring the reliability and validity of qualitative data can be challenging. In this study, two strategies were employed to address this issue. First, during data collection, periodic clarifications were made to ensure that the findings accurately reflected the participants' intentions, particularly in cases of ambiguity. This involved brief discussions with participants when necessary. Second, data collection continued until saturation was reached, meaning no new themes or insights emerged, ensuring thorough coverage of the topic (Creswell & Poth, 2016; Nakkeeran & Zodpey, 2012).

5.4.2 How the Study 3 Informed the Research Programme.

This qualitative study of 16 participants expands on the quantitative findings (study two) by providing deeper information on the practice, confidence and perceptions of physiotherapists in Cameroon on HP. The explanatory information generated from this study adds more meaning and provides context and views to the quantitative findings, thereby contributing to answering the programme objectives (2 & 3). It provided additional knowledge about current PLHP practices and highlighted Cameroonian physiotherapists' perceptions of their role in HP for pwCVD. These findings are both encouraging and pivotal to the research programme, forming a foundation for planning changes in PLHP practices in Cameroon. The study expanded, clarified, and offered explanations for some of the quantitative findings (Study 2), such as the reasons behind low confidence in delivering HP across various components. While quantitative results indicated positive responses regarding training and the availability of clinical and public health guidelines, the qualitative findings revealed a positive attitude toward HP but a limited understanding of its concepts and application. Furthermore, while the quantitative data identified factors influencing HP among Cameroonian physiotherapists, the qualitative insights delved deeper, linking these factors to both internal and external influences and illustrating their impact on practice. Additionally, the study explored preferred delivery methods and explained the rationale behind these preferences, offering practical recommendations that are both relevant and implementable.

5.5 The Implications of Findings on Practice and Training

The study highlighted a wide range of HP practices, with participants expressing confidence in delivering several components. However, despite their interest and

involvement in HP, the findings revealed gaps in practice, including a lack of awareness and use of behaviour change strategies and the absence of objective tools for assessment and monitoring. The following sections delve into these qualitative findings' practical and training implications.

5.5.1 Inter-Professional/Disciplinary Collaboration

The findings revealed that while participants often referred pwCVD to other clinicians and experts, there was little evidence of active collaboration with these professionals to deliver holistic HP programmes and interventions. Effective collaboration with other disciplines is essential for physiotherapists to implement HP with higher quality and impact at the institutional and national levels in Cameroon. HP goes beyond addressing physical impairments, focusing on disease prevention and improving overall well-being (Alodaibi et al., 2022; Bezner, 2015). Improving interdisciplinary collaboration in Cameroon will enable physiotherapists to tackle complex health determinants such as lifestyle behaviours, environmental factors, and socioeconomic conditions that extend beyond physiotherapist's professional expertise (Hirashiki et al., 2022; Shin et al., 2021).

Engaging with professionals like nutritionists, psychologists, and public health experts promotes a comprehensive approach to HP. For example, psychologists may contribute to the development of behaviour change strategies, while nutritionists provide dietary guidance critical for managing conditions like diabetes, hypertension, and associated risk factors. This collaborative approach improves patient outcomes by integrating diverse expertise into cohesive care plans (Copley et al., 2024; Lamke, n.d.). The use of objective measures was reportedly very low in the study. Interprofessional collaborations may also be improved among physiotherapists by encouraging uptake of objective assessment and monitoring tools such as the body mass index (BMI), International Physical Activity Questionnaire (IPAQ), Dietary Assessment Tools (e.g., 24-hour Dietary Recall), health improvement card (HIC) among others (Craig et al., 2003; Thompson & Subar, 2017; 'WHPA Health Improvement Card', n.d.). Using simple objective measures will provide a basis for initiating HP interventions and highlight a threshold for referral while harmonising practice. This will make communication among professionals and clinicians easier and more effective.

Additionally, interdisciplinary collaboration supports the development and execution of public health initiatives. By partnering with policymakers, educators, and community leaders, physiotherapists can advocate for health equity and address issues such as physical inactivity and chronic disease prevention on a large scale. Working together with

stakeholders such as the Ministry of Public Health, Cameroon National Television (CRTV) among others can facilitate dissemination on a large scale. These partnerships facilitate resource-sharing, increase care accessibility, and ensure consistent HP messaging.

Collaboration also enhances physiotherapists' professional development, offering opportunities for leadership training, research, and mentoring. This broadens their skills, fosters mutual learning, and strengthens their ability to advocate for integrated healthcare systems and population health improvement in Cameroon (Reeves et al., 2017).

5.5.2 Community Outreach and Patient Engagement

The findings reveal minimal to no engagement by physiotherapists in Cameroon in patient engagement or community outreach programmes, either individually or through the National Physiotherapy Association. This represents a significant missed opportunity for physiotherapists to promote health and prevent disease through public engagement initiatives. Community outreach can enable physiotherapists to educate the population about the benefits of physical activity, strategies for injury prevention, and the management of non-communicable diseases (NCDs). Only one participant in the study reported involvement in community outreach, notably in private practice, where engagement appeared commercially motivated, integrating HP to enhance the value of care compared to public practice in Cameroon. Organising HP workshops, fitness sessions, and awareness campaigns is essential. Sensitisation efforts are needed among both public and private physiotherapists to seize this opportunity in Cameroon. Educational institutions, workplaces, and community centres are ideal to address the growing burden of NCDs and physical inactivity (*Global Action Plan on Physical Activity 2018–2030*, n.d.).

Collaboration with local leaders, community health workers, and non-governmental organisations can help establish culturally relevant health programmes. For example, group-based physical activity sessions tailored to various age groups, such as children or older adults, can enhance accessibility and inclusivity (Hansell et al., 2021).

Patients with CVD could benefit from patient-led support groups. Physiotherapists can foster patient engagement through motivational interviewing, coordination, setting realistic goals, and addressing misconceptions about healthy lifestyles (Barroso et al., 2021; Evans & Stewart, 2015). Digital platforms, including mobile health apps and social

media, offer promising avenues to expand reach, particularly in underserved areas of Cameroon.

5.6 Chapter Summary and Implications for the Thesis

This chapter presents a qualitative study that recruited 16 physiotherapists and examined the practices, confidence, and perceptions regarding HP for pwCVD in Cameroon. The chapter begins by discussing contributions from the preceding quantitative study, highlighting key areas that shaped the qualitative investigation. The full manuscript, published as a preprint, is included. Additional information is provided on the qualitative study design, outlining its benefits, potential limitations, and the strategies employed to minimise these challenges. The chapter also details its contribution to the overall research program and specific program objectives.

The chapter also expands on the implications of the findings, emphasising the importance of effective inter-professional and interdisciplinary collaboration. It highlights opportunities to explore practical strategies such as public engagement initiatives and developing patient-led peer support groups in Cameroon.

The subsequent chapter shifts focus to exploring the perspectives and perceptions of pwCVD PLHP through a mixed-methods approach (Study 4).

Chapter Six: People at Risk of, or with Cardiovascular Diseases' Perspectives and Perceptions of, Physiotherapist-Led Health Promotion in Cameroon: A Mixed-Methods Study (Study 4).

6.1 Introduction

This chapter reports on the findings from the sequential explanatory mixed methods study among pwCVDs as a key component of the research programme. It opens with an overview of the study's context and findings that address the programme objective number 4. The complete publication is included, followed by additional information on the research process including the steps that were taken to enhance credibility of the results. The chapter concludes with more detailed implications and contribution of the study to the research programme.

This primary study investigated pwCVDs' perspectives and perceptions of PLHP in Cameroon to address programme objective 4: To explore the perspectives and factors influencing effective health promotion practice and adherence among pwCVD. A sequential explanatory mixed methods design was chosen as the most appropriate approach as it combined the strength of both quantitative and qualitative methods to provide more comprehensive answers to questions (Creswell & Inoue, 2024; McBride et al., 2019).

The mixed methods findings were accepted on October 17, 2024, and published in the international peer-reviewed *Journal of Environmental Research and Public Health on October 1*9, 2024. Since publication, the article has been viewed 1264 times (as of December 15, 2024) and widely shared on social media.

6.2 Published Paper: Study 4

This mixed-methods study (Study 4) is reproduced here, with the publisher's permission, in the format it was published online.

6.2.1 Erratum: People at Risk of, or with Cardiovascular Diseases' Perspectives and Perceptions of, Physiotherapist-Led Health Promotion in Cameroon: A Mixed-Methods Study

Table 1 in the published paper reproduced here had errors with percentages and a column for missing responses. The same table reproduced here have those errors addressed.

Table 1. Sociodemographic and clinical characteristics of the participants enrolled in the study(n=146).

Variable		**n**	**%**	
Sex	Male Female	69 77	47.3 52.7	
Mean age (years)	46.18±14.77	146	100	
Educational level	Primary school High school Secondary school Undergraduate degree Postgraduate degree Others (No formal education)	42 21 29 30 20 3	29.0 14.5 20.0 20.7 13.8 02.1	
Cardiovascular diseases	Stroke Heart attack Coronary heart disease	66 1 4	93.0 01.4 05.6	
Cardiovascular diseases risk factors	Hypertension Overweight Diabetes Regular alcohol consumer High Cholesterol Regular smoker	89 83 31 23 9 7	36.8 34.3 12.8 09.5 03.7 02.9	
Frequency of symptoms and challenges posed by risk factors and cardiovascular diseases among participants	Swelling of limbs Poor sleep Dizziness Cough Palpitations Difficult breathing Chest pain Loss of appetite Vomiting others	56 50 42 30 24 22 21 18 3 4	20.7 18.5 15.5 11.1 08.9 08.1 07.8 06.7 01.1 01.5	
Do you have difficulty with any of the following because of the condition(s)? (n=146)				
	No difficulty	*A little difficulty*	*Difficulty*	*Missing Responses/data*
Taking part in exercise or physical activity (e.g. going to the gym, taking a walk)	19.9%(n=29)	23.3%(n=34)	6.8%(n=83)	0
Doing usual daily activities (e.g. cleaning, cooking)	23.8%(n=34)	20.3%(n=29)	56%(n=80)	3
Following medications	70.6%(n=101)	10.5%(n=15)	18.9%(n=27)	3
Making hospital visits	55.6%(n=79)	13.4%(n=19)	31.0%(n=44)	4
	Not at all	*Sometimes*	*Always*	
Do you follow medicine/drug recommendations suggested by your physician or other specialist?	6% (n=13)	17%(n=24)	74%(n=107)	2

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People at Risk of, or with Cardiovascular Diseases' Perspectives and Perceptions of Physiotherapist-Led Health Promotion in Cameroon: A Mixed-Methods Study

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Abstract: Cardiovascular diseases (CVDs) and their risk factors are a major cause of illness and death worldwide, especially in low- and middle-income countries like Cameroon. Physiotherapist-led health promotion (PLHP) has proven effective in improving health and reducing CVD risks. Understanding patient perspectives is crucial for designing effective, context-specific PLHP interventions. This study explored patients' views, experiences, perceived usefulness, acceptability, and preferred methods of PLHP, through a sequential explanatory mixed-methods approach. The quantitative data highlights a significant burden of CVD conditions and risk factors among patients seen in physiotherapy services. Qualitatively, three themes were identified and included: (1) perspectives and experiences of people at risk or with CVDs (pwCVDs) on PLHP; (2) perceived usefulness and acceptability of PLHP; (3) preferred delivery methods of PLHP. Participants reported positive feedback on PLHP and physiotherapy services. Barriers to effective PLHP included high workloads for physiotherapists, limited service access in rural areas, and prohibitive costs. Despite these challenges, participants expressed strong confidence in physiotherapists' competence, though they also called for improved regulation and ongoing professional development. PLHP components, especially physical treatment and dietary advice, were deemed highly useful and acceptable. Patients suggested various delivery methods, including peer support groups, home visits, and mass media interventions. This study highlights the need to improve the scope of practice, competence of physiotherapists, and accessibility of physiotherapy services in Cameroon for pwCVDs. It is necessary to adopt multidisciplinary approaches to achieve better outcomes for risk factors like diabetes and hypertension in context.

Keywords: cardiovascular diseases; risk factors; physiotherapist-led health promotion; Cameroon

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1. Introduction

Cardiovascular disease (CVD) and associated risk factors are responsible for a significant proportion of morbidity and mortality burden of all non-communicable diseases (NCDs) globally [1]. The global prevalence of CVD increased from 271 million in 1990 to 523 million in 2019, with an associated increase in deaths from 12.1 million to 18.6 million over the same period [2]. The majority of all CVD mortality occurs in people under 70 years of age, with low- and medium-income countries (LMIC) accounting for over 85% of these deaths [2]. This suggests that effective, context-specific interventions are still required to reduce this burden in LMIC [3].

In many LMICs, health systems are highly strained due to the double burden of infectious diseases and rising incidence of NCDs [4]. CVD accounts for approximately 10% of all hospital admissions in Sub-Saharan Africa [5]. One African study demonstrated an increase in the trend of CVD admission from 4.6% to 8.2% over a decade (2004–2015), representing a 78% increase over this period [6]. The increasing burden is associated with concurrent increases of modifiable risk factors such as tobacco use, unhealthy diet, overweight and obesity, physical inactivity, and harmful use of alcohol in LMIC like Cameroon [7].

Cameroon, located in Central Africa, has an estimated population of over 29 million inhabitants as of 2024 [8,9]. Cameroon's decentralized health system operates at three levels: central, intermediate, and peripheral, with the Ministry of Public Health overseeing the management and implementation of public health services [10]. Approximately 6.4% of the population is covered by health insurance, and the burden of healthcare is on households, with 64% of the households being unable to access healthcare due to high costs [11].

The burden of NCDs in Cameroon is rising, with risk factors overtaking some regional and global prevalence statistics. For example, 30.8% of Cameroonian women were living with high blood pressure in 2015 compared to 20.1% of women globally [12]. The prevalence of diabetes in Cameroon is estimated at 6% higher than in Africa at 3.85% prevalence [13,14]. Approximately 43.8% of Cameroonians use tobacco, compared with global figures of 36.1% [12]. An estimated 26% of Cameroonians live with hypercholesteremia compared to 25.5% among adults in Africa [15,16]. Hypertension is responsible for 41.3–54.49% of heart diseases in Cameroon [17,18]. CVD accounted for 10–16% of all hospitalizations in Cameroon, with the most prevalent CVDs being heart failure (38.5%), stroke (33.3%), and uncontrolled hypertension (22.4%) [5].

Healthcare providers in Cameroon need to address the challenge of avoidable risk factors to decrease the prevalence of CVD. There are limited effective health promotion (HP) strategies and implementation programs, and this, coupled with an undeveloped and fragile health system, is contributing to the rising risk factors and CVD [5,19]. There is increasing evidence that public health interventions are cost-effective and that secondary prevention models such as cardiac rehabilitation (CR) provide several benefits to patients [20,21]. Despite these benefits, promotive and preventive intervention programs such as HP and CR uptake and adherence in resource-limited settings like Cameroon remain poor. This is due to various factors, including a lack of trained health personnel, limited resources, competing priorities, affordability, accessibility issues, and lack of insurance coverage [22]. While there are extensive HP and prevention programs for people at risk or with CVD (pwCVDs) in high-income countries (HICs), they are either limited or completely absent in low-resource settings such as Cameroon [21].

With the absence of established HP and prevention programs in Cameroon, physiotherapists, with their core knowledge of physical interventions, exercise, and health education, are well placed to assume this role [23,24]. Physiotherapist-led health promotion (PLHP) may be a viable way to introduce or augment promotive and preventive interventions for pwCVDs. Physiotherapists manage a wide range of these patients and can engage them in HP and disease prevention through brief interventions (opportunistic advice, discussion, negotiation, or encouragement on various key public health issues) [25,26]. Enabling meaningful patient involvement results in better-informed decisions regarding care choices and aligns patient preferences with the resources at hand, which is crucial for successful lifestyle interventions [27]. This can improve understanding of health issues, context, surrounding circumstances, relevant health needs, personal values, preferences, and concerns about the proposed course of action [27]. As patient engagement becomes more effective, it fosters shared decision-making among practitioners and patients, thereby enhancing patient's long-term adherence to interventions. [28,29]. Patients' perceptions of healthcare providers significantly impact their adoption and adherence to lifestyle changes [30,31]. Having real patients articulate their fears and concerns about PLHP may allow physiotherapists to

appreciate their patients' perspectives, build trust, and provide care and education with better outcomes [27].

There is a lack of data on patient preferences and acceptability of HP interventions [32]. Closing this evidence gap is crucial for delivering quality, compassionate, and safe care, particularly in Cameroon, with its rising prevalence and burden of pwCVDs. A mixed-methods study is suitable for this topic because it integrates the strengths of both qualitative and quantitative research methodologies to increase understanding and provide more comprehensive answers to research questions [33]. Thus, the aim of this mixed-methods study was to explore the perspectives of Cameroonian pwCVDs' experiences, needs, and preferences regarding a PLHP intervention and its delivery.

2. Materials and Methods

2.1. Study Design and Theoretical Underpinning

This study employed a two-part, sequential explanatory mixed-methods design following guidelines and recommendations for conducting and reporting mixed-methods studies [22,33]. This mixed-methods study was underpinned by a pragmatic paradigm and conducted in two phases [33]. In the first phase, a descriptive, cross-sectional survey was conducted to assess pwCVD views on PLHP in Cameroon. The specific objectives were: (i) to investigate the experiences of pwCVDs regarding their health and PLHP, and (ii) to establish which components of PLHP pwCVDs they might find useful and acceptable. Data was collected from 2 October 2023 to 29 December 2023. In the second phase, semi-structured interviews were conducted with a purposive sample of the surveyed participants to develop an in-depth understanding of their views of PLHP in Cameroon from 15 January 2024 to 16 February 2024. The specific objectives of the qualitative study were (i) to explore the experiences and concerns of pwCVDs on PLHP, (ii) to gain an in-depth understanding of which components pwCVDs find useful and acceptable, and (iii) to explore the preferred methods of PLHP delivery among pwCVDs

2.2. Study Setting

Physiotherapy practice in Cameroon lacks specialist physiotherapy services in either the public or private sectors [34]. Patients access physiotherapy services directly from home (self-referral), through referrals by other healthcare providers in hospital settings, or through referrals from healthcare institutions without physiotherapy services. A small number of physiotherapists also work in private practice. The majority of physiotherapists are concentrated in urban areas, with very little formal provision of physiotherapy services in rural areas [35]. Therefore, patients in many rural areas who need physiotherapy services may need to travel to urban areas to access these services in established clinics and hospitals.

The study was conducted in physiotherapy services across four cities in Cameroon, namely, Bamenda, Buea, Douala, and Yaoundé, to enhance access to an optimal number and diversity of pwCVDs. The physiotherapy services of the following hospitals were used: Regional Hospital, Bamenda; Military Regional Hospital, Yaoundé; Laquintinie Hospital, Douala; Buea Regional Hospital; IDIMED Polyclinic, Douala; Yaoundé General Hospital; the National Centre for the Rehabilitation of Persons with Disabilities, Yaoundé; the University Teaching Hospital, Bamenda Regional Hospital, and Limbe Regional Hospital.

2.3. Study Population

All participants were pwCVDs accessing physiotherapy services for the management of their condition and other related health concerns or complications. To be included in the study, participants had to be eighteen years or older, present with at least one risk factor for CVD (hypertension, diabetes, overweight and obesity, dyslipidemia), or present with a diagnosis of CVDs, which may include heart failure, surgical heart condition, coronary artery disease, coronary heart disease, stroke, or myocardial infarction [7]. All participants received physiotherapy for at least two weeks and could communicate well in French or English. Exclusion criteria included people with long-term cognitive or communication

impairments preventing them from providing informed consent, for example, people living with Alzheimer's disease and dysphasia. People who live with pre-existing psychotic illness, such as schizophrenia, or those receiving end-of-life care were also not eligible to take part in the study.

2.4. Recruitment

Practicing physiotherapists in participating services identified all eligible participants. Trained data collectors, i.e., physiotherapists, students on placement or the investigator (EN), then contacted the potential participant to explain the objectives of the study and procedure. A screening form with the inclusion and exclusion criteria for the study was used to assess participant eligibility. Each eligible participant, depending on his/her preference, was given an information sheet in English or French for the study. When consent was granted, the survey instrument was then administered electronically (Phase 1). During this phase, all consenting participants were asked whether they would be willing to take part in a follow-up interview (Phase 2). Participants provided their preferred contact details for later use in arranging the interview.

2.5. Phase 1: Quantitative

2.5.1. Patient Survey

The survey instrument was designed to collect the following data (Supplementary File S1): Section A; demographic information, Section B; perception of pwCVDs towards PLHP, and Section C; acceptability and usefulness of PLHP. The survey took approximately 10–15 min to complete. The completed survey instrument was piloted, and all feedback was used to improve on the survey instrument before final administration.

2.5.2. Training of Data Collectors

Data collectors were trained by the lead author (ENN) in the selected hospital establishments. This consisted of two physiotherapists and three physiotherapy students on clinical placement to enhance the continuity of data collection in the absence of the principal investigator. The training was directed toward understanding the purpose of the study, how to deliver the information sheet and seek consent, and how to access the survey tool, complete it, and submit it electronically.

2.5.3. Sample Size Calculations

Calculator.net was used to estimate the sample size for the survey [36]. We used an estimated annual population size of 2000 pwCVDs across the participating hospitals and a population proportion of 90% with an eligible condition. With a significance level set at 0.05 and a margin of error of 5%, the sample size for this study was estimated to be approximately 130 participants. Other similar patient surveys examining patient preferences for treatment of LBP, inflammatory bowel disease, spinal surgery, and diabetes have recruited 130–170 participants [37–39]. To consider errors within estimates, the target sample was set at an upper limit of 170 participants.

2.5.4. Data Collection

The survey instrument was administered electronically via a link using mobile phones, tablets, iPads, and laptops, independently by the patient or with the aid of a data collector. Where participants consented but had no means to complete the survey, the investigator or trained data collector facilitated completion on electronic devices dedicated to the study.

2.5.5. Data Analysis

Data were checked in Qualtrics. The data were then downloaded in Microsoft Excel 365 format and transferred to SPSS (IBM SPSS Statistical Software, version 26.0) for statistical analysis. Descriptive statistics (frequencies, central tendency, dispersion/variation, and

percentages) were used to present the participants' demographic information and pattern of practice. All data were considered in the analysis regardless of missing responses.

2.6. Phase 2: Qualitative Interviews

2.6.1. Sampling and Recruitment

Participants were selected purposively from those who provided preliminary consent to follow-up interviews as part of completing the survey (phase 1). This was based on gender, level of education, duration of receiving physiotherapy, various characteristics typical of pwCVDs, and geographical locations of the patients. All participants were contacted via their preferred contact details, which they provided in Phase 1. Recruitment was carried out through telephone and in-person communication. Once participants provided written consent, arrangements were made to conduct the interview in a mutually convenient place, considering the participant and investigator's safety. For consistency, before each interview started, the investigator read a script that explained the purpose of the study, that participation was voluntary, that there were no known risks for participation, and what to expect in terms of content and duration of the interview.

2.6.2. Data Collection

Interviews were conducted face-to-face using individual semi-structured questionnaires. Permission was obtained from each participant to record the interview to ensure the accuracy of the resulting transcripts [40]. A topic guide (Supplementary File S2), informed by previous literature, facilitated the interviews [41]. The investigator used a general warm-up question specific to the patient's condition before addressing all central questions to build rapport in the presence of the audio recording device [42]. The interview recording was transcribed verbatim, including verbal expressions and body language that revealed considerable emotions and or expressions of feeling on specific issues [43]. A field diary was kept with comments, explanations, descriptions, and interpretations of patients' responses.

2.6.3. Sample Size Determination

While a range of 3 to 10 participants is considered appropriate for qualitative studies using semi-structured interviews [44], a similar physiotherapy qualitative study used 13 participants [45]. We aimed for an upper limit of 20 participants as recommended for studies of lived experience or without a well-defined cultural domain [46]. This upper limit was assumed to provide adequate information based on the aims and the underdeveloped nature of the PLHP for pwCVDs [47]. However, data collection was stopped at 13 interviews as data saturation occurred, and no further additional themes emerged from the dataset [48].

2.6.4. Data Analysis

The qualitative data collected was analyzed using a two-stage reflective thematic analysis [49,50]. The first stage employed the 6-step thematic approach recommended by Braun and Clarke [49], and the second stage was a methodological reflection to understand and derive meaning from the generated data in context [50]. The interviews were transcribed and coded using NVivo 12 [51]. The reviewers (E.N.N. and B.S.) used the results of the first interviews to develop common categories and subcategories, which were then clarified and supported with quotes from an interview transcript. The general categorization evolved until the end of the analysis [49].

The methodological reflection was based on the categories obtained from the descriptive analysis, and conceptual categories were developed beyond merely describing the themes and subthemes to give interpretation to the thematic descriptions that emerged from the interviews [50].

Two researchers (E.N.N. and B.S.) conducted a joint analysis after they had analyzed each interview separately. Interviews took between 21 min and 38 min. We concluded that data saturation had been achieved by comparing interview data throughout the analysis process and observing that no new aspects, dimensions, or nuances of codes were emerging.

The interpretation of the interviews was verified by two co-investigators (R.Y. and S.M.). The findings were written according to guidelines for reporting qualitative research [52].

2.7. Reflexivity

Engaging in reflexive thematic analysis requires researchers to acknowledge and express the underlying assumptions guiding their approach and interpretation of qualitative data [53]. In this study, coders practiced reflexivity during the coding process by considering their professional role and research biases that could impact the interpretation of qualitative responses. The two qualitative coders in this study (E.N.N. and B.S.) identify as black and white males, emerging and early middle-aged adults, with an interest in health promotion. Throughout the coding process, they remained mindful of their biases and endeavored to assign themes based on data rather than their own biases informed by previous research and knowledge [53].

2.8. Triangulation and Integration of Findings

This study adopted and reported triangulation of data during data analysis and interpretation based on the methods (survey and qualitative findings), investigators (multiple observations), and data source (pwCVDs) at the end of the study [54]. The triangulation process involved the initial sorting of themes and categories from the qualitative data and relating it to the quantitative findings to create a coding matrix. The data was then analyzed to see if there was agreement, dissonance, or partial agreement between the data sets [54].

3. Results

3.1. Participant Characteristics

A total of 146 respondents and 13 participants in Phases 1 and 2, respectively, were included in the final analysis, with the characteristics summarised in Table 1. In phase 1, most respondents were females (52.7%), with the average mean age of all participants being 46.18 ± 14.77 years. Respondents with primary education (29.0%, n = 42) and undergraduate degrees (20.7%, n = 30) constituted higher proportions for education levels. Most respondents (68.4%, n = 100) had multiple risk factors, with hypertension (60.9%, n = 89) and overweight (56.8%, n = 83) being the most prevalent. Stroke (45.2%, n = 66) was the most prevalent CVD and was associated with multiple risk factors. The most prevalent symptoms were swelling of arms and legs (38.3%, n = 56) and poor sleep (34.2%, n = 50). The greatest challenges for pwCVDs included taking part in physical activity or exercise (56.8%, n = 83), doing usual activities of daily living (56.0%, n = 80), and making hospital visits (31.0%, n = 44). Most respondents on medications (73.3%, n = 117) followed medical recommendations for health promotion or medical management of chronic conditions.

Table 1. Sociodemographic and clinical characteristics of the participants enrolled in the study (n = 146).

Variable		n	%
Sex	Male	69	47.3
	Female	77	52.7
Mean age (years)	46.18 ± 14.77	146	100
Educational level	Primary school	42	29.0
	High school	21	14.5
	Secondary school	29	20.0
	Undergraduate degree	30	20.7
	Postgraduate degree	20	13.8
	Others (No formal education)	3	2.1
Cardiovascular diseases	Stroke	66	93.0
	Heart attack	1	1.40
	coronary heart disease	4	5.63

Table 1. *Cont.*

Variable		n	%
Cardiovascular disease risk factors	Hypertension	89	36.77
	Overweight	83	34.30
	Diabetes	31	12.80
	Regular alcohol consumer	23	9.50
	High Cholesterol	9	3.71
	Regular smoker	7	2.89
Frequency of symptoms and challenges posed by risk factors and cardiovascular diseases among participants	Swelling of limbs	56	38.36
	Poor sleep	50	34.25
	Dizziness	42	28.77
	Cough	30	20.55
	Palpitations	24	16.44
	Difficult breathing	22	15.07
	Chest pain	21	14.38
	Loss of appetite	18	12.33
	Vomiting	3	2.05
	Others	4	2.74
Do you have difficulty with any of the following because of the condition(s)? (n = 146)			
	No difficulty	A little difficulty	Difficulty
Taking part in exercise or physical activity (e.g going to the gym, taking a walk)	19.9% (n = 29)	23.3% (n = 34)	6.8% (n = 83)
Doing usual daily activities (e.g., cleaning, cooking)	23.8% (n = 34)	20.3% (n = 29)	56% (n = 80)
Following medications	70.6% (n = 101)	10.5% (n = 15)	18.9% (n = 27)
Making hospital visits	55.6% (n = 79)	13.4% (n = 19)	31.0% (n = 44)
	Not at all	Sometimes	Always
Do you follow medicine/drug recommendations suggested by your physician or other specialist?	8.9% (n = 13)	16.4% (n = 24)	73.3% (n = 117)

Thirteen participants completed the semi-structured interviews, including males (n = 7, 53.8%) and females (n = 6, 46.2%) with a mean age of 56.31 ± 12.11 years ranging from 37 to 79 years. Participants had established CVD and multiple risk factors. Detailed characteristics of interviewed participants can be found in Table 2.

Table 2. Characteristics of participants interviewed for PLHP (n = 13).

Participants	Age/Years	Gender	Profession	Academic Qualification	Risk Factor(s) and/or Cardiovascular Condition
* P1	79	* M	Retired school administrator	Postgraduate degree	Hypertension, diabetes, stroke, high cholesterol, and CHD *
P2	49	* F	Agricultural engineer	Postgraduate degree	Overweight
P3	64	M	Community Development Officer	Undergraduate degree	Insomnia, hypertension, and overweight
P4	68	F	Retired Civil Servant	Undergraduate degree	Stroke, hypertension, overweight, and high cholesterol

Table 2. *Cont.*

Participants	Age/Years	Gender	Profession	Academic Qualification	Risk Factor(s) and/or Cardiovascular Condition
P5	37	M	Unemployed	No formal education	Stroke and hypertension
P6	56	M	Business	High school	Hypertension, overweight, stroke, and high cholesterol
P7	39	F	Translator	Postgraduate degree	Overweight
P8	65	M	Business	High school	Overweight
P9	46	F	Teacher	Postgraduate degrees	Overweight
P10	60	F	Retired nurse	Undergraduate degree	Hypertension, diabetes, overweight, and high cholesterol
P11	46	M	Business	Diploma	Overweight
P12	63	M	Retired physical education and sports teachers	Undergraduate degree	Hypertension, diabetes, and overweight
P13	60	F	Retired civil servant	Undergraduate degrees	Overweight, diabetes, hypertension, physical inactivity, and stroke

* P: participants, M: male, F: female, CHD: coronary artery disease.

3.2. Synthesised Findings

Analyses of the transcripts generated three themes, which included: (1) perspectives and experiences of pwCVDs on PLHP, (2) perceived usefulness of PLHP by pwCVDs, and (3) preferred delivery methods of PLHP (Figure 1). Complete and independent results of both the quantitative and qualitative phases can be found in Supplementary File S3.

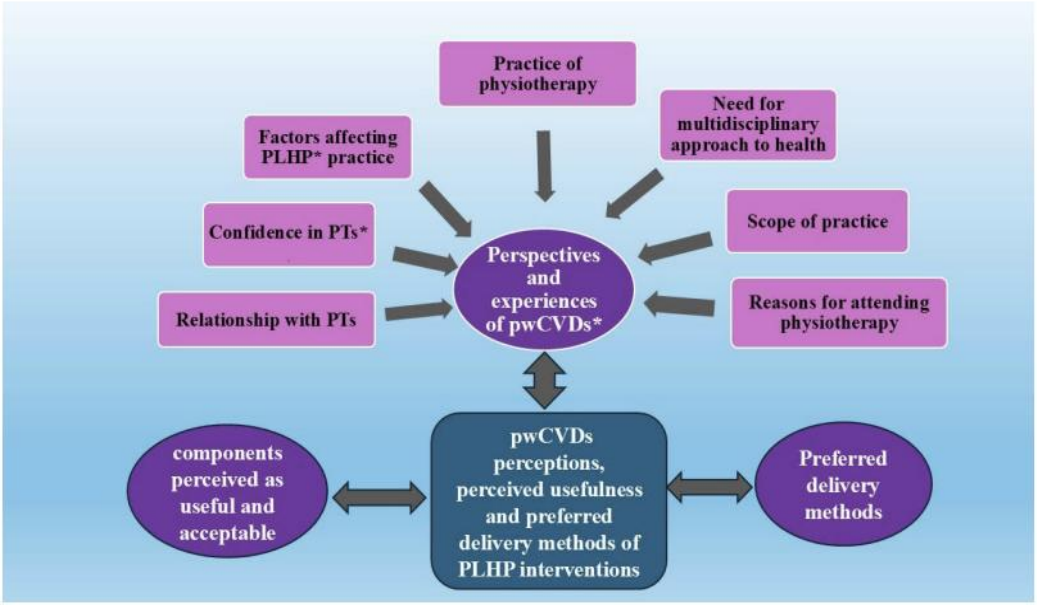

Figure 1. Summary of the qualitative findings showing the first and second-order themes of phase 2. * PLHP: physiotherapist-led health promotion, pwCVDs: People at risk or with cardiovascular diseases, PT: physiotherapist.

3.3. Perspectives and Experiences of pwCVDs on PLHP

3.3.1. Reasons for Attending Physiotherapy

The quantitative findings demonstrated a diverse range of CVDs and risk factors, with stroke as the leading CVD (93.0%, n = 66), hypertension (36.77%, n = 89), and overweight (34.30%, n = 83) as the leading CVD risk factors. The leading symptoms among respondents were swelling of the limbs (38.36%, n = 56) and poor sleep (34.25%, n = 50). The qualitative findings demonstrate that some participants access physiotherapy services primarily due to cardiovascular conditions or risk factors, while others had cardiovascular issues identified as secondary concerns, such as being overweight, having diabetes, and hypertension. This could be following traumatic incidents or low back pain, among others.

> *"I started physiotherapy because of insomnia and being overweight".* (P3)

> *"I was a victim of an accident. I was operated upon, and I was unable to move. I was bedridden. So, after the operation, the doctor advised that I could go for physiotherapy to help speed up the recovery. So, just like a week after the operation, I started physiotherapy".* (P7)

3.3.2. Scope of PLHP Practice

The quantitative findings demonstrate that 58.9% (n = 86) of the respondents believe that the role of physiotherapists is not limited to exercise prescription. Qualitative findings also demonstrated that patients felt that although physiotherapists emphasized the importance of exercise and physical activity, they could also have a wider role in delivering other relevant aspects of HP. Most participants reported that they had received and appreciated information on a range of PH topics related to alcohol (n = 3), diet (n = 8), etc., even though PTs might not be experts in these areas. Physiotherapists less frequently and superficially covered HP activities related to sleep, lifestyle, etc. The majority of participants felt that physiotherapists could be delivering more strongly in a greater number of HP activities.

> *"What they do is just exercise, but as concerns nutrition and other health issues. I think no one has ever told me about it, regarding stress management, nothing".* (P11)

> *"I don't really know some areas of the therapist's scope of work, but they can advise us on diet which is good".* (P10)

3.3.3. Relationship with Physiotherapists

The majority of the respondents indicated that their physiotherapists have never made them uncomfortable (81.4%, n = 118) and can form good relationships with patients (79.45%, n = 116). Qualitatively, most participants (12/13) reported having very healthy and supportive relationships with physiotherapists, although 1/13 participants reported that not all physiotherapists form good and healthy relationships with their patients.

> *"No, there are very interesting people, 'he laughs' for my own sessions that I had were very interesting, very interesting. A lot of encouragement and you could see results".* (P3)

> *"But others look a little bit, more of military kind of harsh to patients, some of them, but not all. Others are wonderful".* (P12)

3.3.4. Physiotherapy Practice

The quantitative data shows that less than half of respondents had discussions about treatment goals and objectives (47.9%, n = 69). The qualitative findings also complemented this result. Three participants (3/13) were aware of the importance of goal setting in physiotherapy practice and acknowledged that they have yet to have discussions around treatment goals with their physiotherapist. Some participants were not aware of this, but some were aware that it is part of the approaches to physiotherapy practice.

> *"The first thing I would like to know from the physiotherapist is to know about my goals, which I never had. I have a problem with my lower back. At the end of the therapy, I*

should be able to do what I was unable to do before starting the therapy. So, that should be my goal at the end of my treatment. If I achieve my goal, then I know that things went well. Yes!". (P10)

Participants also perceived that physiotherapy is not well regulated, and the training facilities are limited. Consequently, this led to a shortage of physiotherapists in many hospitals. Participants hold the view that physiotherapists should be professional in their approach and obtain contemporary and standardized training to be effective practitioners.

"*First of all, I must say that what I've noticed that they are charlatan physiotherapists*". (P1)

"*So they really need to increase the number of people that are training in this area because you go to some hospitals, and you hardly find a physiotherapist. Then most of the time you have nursing aid assistant that have been trained informally in hospital settings, and they are handling this type of issues*". (P3)

3.3.5. Need for a Multidisciplinary Approach to Health

The majority of respondents on medications (73.3%, n = 117) followed medical recommendations for either health promotion or medical management of chronic conditions. The swelling of arms and legs (38.3%, n = 56) and poor sleep (34.2%, n = 50) were the most prevalent symptoms amongst the respondents. Qualitatively, participants held the view that physiotherapists cannot treat and manage all conditions and risk factors, such as diabetes and hypertension, independently and should work in synergy with other relevant clinicians.

"*But in the real treatment, I think that the specialists of this area are more competent if they want to take it as a disease to treat. But for the physiotherapists, I see him handling it as something resulting from his own specialty and something which his advice can equally help to check. But for treatment per say, I don't think so*". (P1)

3.3.6. Factors Affecting PLHP Practice

Our quantitative data shows only 18.6% of respondents (n = 27) think that the workload of the physiotherapists limits their engagement in HP. The majority (40.6%, n = 59) think workload has no impact on physiotherapists' engagement in HP. The qualitative data suggests that participants believe the workload for the physiotherapy service was too much and may impact the ability of the physiotherapist to deliver HP messages. This then also translated to prolonged waiting time for the patients.

"*So I just felt that they have a lot of work because the person that comes here is working elsewhere. He has full-time work. So when he comes here, maybe he has to rush to his office or has other patients to see, I just feel like they are not putting enough time*". (P4)

"*I think everything boils down to time. Sometimes I feel that I don't have enough time, the workload at the level of the physiotherapist (long waiting time)*". (P2)

In addition, some participants (12/13) believe there is a significant demand for physiotherapy services, and people are suffering unnecessarily because they are unaware of the service's role and importance. They expressed concerns about limited access, especially for patients in rural areas, as services are primarily available in urban areas with a limited workforce. The number of physiotherapists needs to be increased to meet the growing demand. Participants suggested that, in addition to increasing the number and quality of physiotherapists, the government should provide subsidies and insurance policies to help citizens access these services, as the cost of physiotherapy sessions was identified as a major barrier to accessing the services, limiting the number of sessions for some and rendering therapy ineffective for others.

"*Well, for the cost. I won't say it is quite affordable because someone who has to do physiotherapy, let's say, for 2 months, 3 months, and people go even beyond that. If*

you have to pay because, at the beginning, I had to come every day. So considering the standard of living here in our country, I think that the cost is not quite affordable for everyone". (P7)

"*Subvention for citizens, the government chooses to subsidise this issue, if they want the improvement of their citizens, it's not all about money the government rules citizens. It doesn't rule people. People pay taxes because of their health care*". (P11)

There is a belief among some participants that the government should implement policies for public awareness and education on health issues based on national statistics, emphasizing that public health intervention should be strengthened rather than leaving health issues to individual patients.

"*You know things that come from the government media is valued by the populace, where people believe that if they're saying this thing now and bring it out, you see the specialists coming to talk, people are taking more seriously because they are giving statistics, national statistics. At the macro level, what is happening in the nation with this and the consequences? People will take it more seriously rather than me going informally and doing my Google search and checking on it; when they start talking like that, it becomes a policy issue. Yes, and people will take it more seriously*". (P11)

Most respondents (66.67%, n = 96) reported that physiotherapists always praise and motivate them to reach their goals. Qualitative findings indicate that some participants (3/13) found visiting physiotherapy services more beneficial than joining sports clubs or exercising independently, as they struggled to maintain motivation on their own. They also noted that the lack of equipment and inadequate investment and training in physiotherapy services by hospital administrations contribute to the poor performance of these services.

"*So I feel better here. If they can make it more frequent per client, it will be nice. I come and exercise, somebody follows me, is very nice, in the club is not the same. People are doing it their own and, in the club, you may injure one part of your body. Just because they just do their business you know, they are not specialists most of the time*". (P3)

"*Alone I cannot do it but when I come here, they are very specific. And I do not really like it alone because whenever I'm tired, I just get up and go. But here they say, no, 15 min, you still have 3 min, and I make the effort*". (P13)

Additionally, participants (3/13) felt that some of the education and advice from physiotherapists were unclear and not patient-centered, making them difficult to follow. The advice sometimes seemed passive, as patients felt instructed to follow it without understanding its importance. Participants expressed a desire to extend PLHP services to home visits or self-delivery.

"*Yeah, because what I'm saying is that when you tell him to do some physical exercise, which by his very nature, he cannot do it, it means nothing. So, it is good to tell somebody what he can do. I've had the experience where I'm told what to do, which I cannot do*". (P1)

"*I would love that. But because I am having challenges, I think that doing it in a group might not be very comfortable working in a group. That's why I always like home visits; I'm still striving for home visits*". (P5)

3.3.7. Confidence in Physiotherapists

Quantitatively, 60% of respondents (n = 87) believe that physiotherapists have the skills to assist them with their conditions. This was further supported by the qualitative findings, as the majority of the participants expressed strong confidence and trust in the physiotherapy workforce. While some participants (4/13) expressed reservations about fully trusting their physiotherapist, they still found them to be very helpful in their practice. Regarding training and competence, participants acknowledged that physiotherapists are generally competent but noted there is room for improvement. Some participants (7/13)

felt that, regardless of their perception of competence, the managers of physiotherapy establishments should ensure competence and standards of practice. Also, some participants believe that physiotherapists need ongoing support and supervision in their practice.

> *"The physiotherapist wants me to be well. So, I don't think that is any advice or restrictions that they can give me, which can be contrary to essence, I don't think so. What I got, help me and for me, what they do, I don't see anything to object"* (P4)

> *"Most of the time they are lacking, and they need somebody who should be overseeing them, who is actually very professional overseeing them, especially in the government settings"*. (P3)

3.4. Perceived Usefulness and Acceptability of PLHP

3.4.1. Components Found to Be Useful

The quantitative data shows that the majority of the respondents perceived PLHP to be very useful, with a mean score of 86.8% (n = 124) across all components (i.e., diet, sleep, stress management, etc.). The component with the highest proportion of perceived usefulness was dietary advice on fruits (91.6%, n = 132), and the lowest was advice or education to stop smoking (75.35%, n = 107). The qualitative data revealed that participants viewed diet and nutrition as a crucial aspect of PLHP, recognizing the importance of combining it with other components. Some participants also deemed physical treatment essential, including exercises on the treatment bed. Most participants found the education and interventions provided by physiotherapists to be universally useful, without a preference for specific components.

> *"What I know is that their advice, in general, is useful. Yes, I know that is useful, but to say, I can choose one for the other, no"*. (P1)

> *"No, no, "Nodding in disagreement" they should talk about everything. They should talk of everything that will help me"*. (P6)

3.4.2. Components Found to Be More Acceptable

The majority of the respondents found PLHP advice/education acceptable across multiple components, with a mean score of 94.65% (n = 131). Increasing general physical activity advice was the component that was most acceptable (95.80%, n = 137). Conversely, advice on alcohol consumption had the highest rate of unacceptability, with 4.8% (n = 7) of respondents. This is because respondents who do not drink alcohol do not value such counsel. Qualitative findings indicated that participants viewed these interventions and educational efforts as highly beneficial and essential for managing their conditions. They emphasized that such resources should be publicly accessible, with physiotherapists playing a key role in leading exercises, planning, and educating the public, given their crucial impact on health outcomes.

> *"When I suddenly had a stroke in 2013, it was necessary for me to get to physiotherapy for treatment. Well, I can say that was an important element in my treatment because they said it. Yes, I was heavily encouraged to do that. Let me add that it helped me a lot"*. (P1)

> *"Physiotherapists hold a transformational position in people's health"*. (P9)

3.5. Preferred Methods of PLHP Delivery

This aspect was only explored during the qualitative phase of the study. Participants proposed and justified a variety of delivery methods based on their experiences, conditions, circumstances, or observations of the physiotherapy service. Patient peer support groups were considered beneficial for sharing experiences and challenges to improve adherence to PH interventions. Due to personal challenges such as communication or mobility issues, some participants valued privacy and preferred home visits, although they acknowledged that arranging and maintaining these visits can be costly. Participants also advocated

for one-on-one discussions or education, citing reasons such as mobility issues, different pathologies, and the need to clarify doubts. Some participants preferred group discussions and lectures with physiotherapists, as this saves time and ensures effective communication, especially for people with similar conditions. Others suggested that regular audiovisual or mass media slots could have a broader impact on disease prevention and health promotion. Some preferred workshops, seminars, or regular talks, provided they are invited in advance, either free or at a minimal cost. Participants also mentioned positive experiences with using apps and expressed interest in having access to them. Participants also highlighted that written or printed information is helpful for various reasons, though a few found it challenging due to reduced vision. A few participants did not prefer the delivery method but valued any information that could improve their health (Sample quotes can be found in Supplementary File S3, qualitative results).

4. Discussion

This mixed-methods study aimed to provide a comprehensive overview of patients' experiences, perceptions, and preferences of PLHP for pwCVDs in Cameroon to inform intervention development. Our data reflects participants' views of multiple risk factors and challenges and demonstrates positive perceptions of PLHP delivered via multiple methods. The qualitative and quantitative data were agreed well across the study elements.

Consistent with previous research from Ghana among stroke patients [55], approximately two-thirds (68.4%) of our respondents had multiple CVD risk factors. They, however, reported a higher prevalence of hypertension (85%) and obesity (58%) compared with 60.9% and 56.8% in our study, respectively. These differences could be explained by their study being conducted among stroke survivors [55]. Conversely, Mastwyk and colleagues in Australia reported a 37% and 58% prevalence of metabolic syndrome and hypertension among clients attending private practice physiotherapy with predominantly musculoskeletal conditions (94%). The differences could be attributed to their study population of musculoskeletal patients with potentially lower levels of CVD markers than in our study population on CVD [56]. The high levels of varied CVD risk factors reported in our study and in the general Cameroon population highlight the need for PLHP strategies adopting multimodal strategies to address this complex problem in Cameroon [5,6,13]. Physiotherapists are well-placed to deliver these HP interventions for pwCVD, other clinical populations, and the general population [24,57].

Consistent with previous research on patients' experiences with physiotherapy services from Kenya and Spain [58,59], our participants reported excellent/good cordial relationships with physiotherapists and perceived PLHP interventions as useful and effective for managing their condition and improving their health. Despite positive perceptions, participants presented challenges related to the competence and scope of practice of physiotherapists, demonstrating the need for comprehensive training and skill development beyond exercise and physical activity to address their needs better. This supports the findings of Severin and colleagues that only 14.8% of physical therapists measure blood pressure and pay attention to examining and educating patients on CVD risk factors in the USA [60]. This may be because of specialist respiratory therapists in the USA, who tend to deal with patients with complex cardiac and pulmonary conditions [61]. Physiotherapists' workloads due to a lack of staff and equipment resulting from prolonged waiting time were reported in our study. This is consistent with previous data reporting 0.92 physiotherapists per 100,000 population in Cameroon and similar across many African countries [58,62], which compares less than favorably with other countries such as South Africa and Germany with 13 and 234.4 physiotherapists per 100,000 respectively [61]. For participants with high levels of disability coupled with challenges to accessing physiotherapy services may mandate a shift towards community-based services to facilitate access. Facilitating community-based programs necessitates collaboration and empowerment of community-based workers and expert patient groups to increase access and sustainability through affordable mechanisms and provide effective health education [24,58].

Contrary to growing evidence that written prescription is more effective and motivating than oral advice for improving lifestyle changes such as physical activity [63,64], the majority of our participants expressed a preference for individual discussions and, to a lesser extent, regular planned educational sessions, group discussions, lectures, printed information, use of apps among others. This could be explained by the degree to which resources are available in Cameroon, including relevant evidence, the internet, and printers. Our participants also highlighted patient-related factors, including loss of eyesight with aging, making reading challenging. Oral advice was preferred because of the advantage of clarifying doubts following relevant questioning. This highlights and emphasizes the need for context and patient-centered considerations in clinical practice.

In summary, the findings of this study suggest that pwCVD perceives PLHP delivery across many components as useful and acceptable. Many positive and some negative patient experiences of physiotherapists delivering PH interventions were identified. Positive and negative experiences also facilitated or limited access to HP information or affected the quality of PLHP interventions. This, coupled with the high prevalence of CVDs and risk factors for CVD, creates an imperative for a more systematic and comprehensive approach to PLHP in Cameroon [65].

4.1. Implications for Practice, Training and Research

4.1.1. Practice

All Physiotherapists should understand how risk factors influence the development and progression of CVD and be competent in delivering lifestyle education, diet, stress management, sleep hygiene interventions, and exercise and physical activity. Therefore, there is a mandate for the Cameroon Society of Physiotherapy (CASP), the Ministry of Public Health, and relevant stakeholders to organize professional development training that covers this wide range of HP activities for practicing physiotherapists. Community-based initiatives and collaboration with community-based health workers and expert patient groups may also be valuable options [66]. A variety of flexible PH delivery methods would support physiotherapists in delivering PH messages to a larger population that may improve compliance and adherence, leading to better health outcomes. Mass media and community outreach may also facilitate patient education and behavior change. Collaboration with other healthcare professionals is crucial to enhance the delivery of PLHP intervention and improve patient outcomes.

4.1.2. Training

The undergraduate physiotherapy training courses must be comprehensive, covering key aspects of HP, such as relevant assessment tools on lifestyle-related behaviors, counselling skills, and behavior change strategies for specific HP components [24]. This will enable qualified physiotherapists to be confident in delivering HP interventions.

4.1.3. Research

Additional research is needed to explore the long-term impacts of PLHP interventions for pwCVD management and outcomes in the Cameroonian context. Therefore, to allocate limited resources effectively, it is necessary to investigate the effectiveness of different PLHP components (e.g., dietary advice and stress management) in improving cardiovascular health. Research should focus on developing and testing patient-centered PLHP models considering individual preferences and barriers.

4.2. Strengths and Limitations

Using quantitative and qualitative methods provided a comprehensive understanding of pwCVDs' perceptions and experiences in physiotherapy services. We also included a diverse sample of participants from four regions of Cameroon across several physiotherapy services, enhancing the generalizability of the findings. Qualitative interviews offered great depth and insights into patients' personal experiences and perceptions of our

findings. A joint analysis by a physiotherapist and a non-physiotherapist qualitative researcher enhances the quality of findings by ensuring they are data-driven and minimizing researcher bias.

The relatively small sample size, particularly for the qualitative component, may limit the generalizability of the findings. However, the recruitment of all participants in the qualitative phase was based on criteria that represented the sample, including gender, condition, and duration of exposure to physiotherapists. Secondly, reliance on self-reported data might have introduced bias, as participants might overestimate or underestimate their experiences and perceptions. Finally, the inclusion of physiotherapy services primarily based in urban settings may not reflect the experiences and perceptions of patients in rural settings.

5. Conclusions

The findings demonstrate positive perceptions and experiences of physiotherapists delivering a variety of HP information and advice in Cameroon with wide acceptance of PLHP interventions. However, pwCVDs also report unmet needs related to service provision, personalization, and tailoring of PLHP interventions. This finding resonates with prior literature on disciplinary workforce development for wider HP intervention engagement and delivery. This underscores the need to enhance physiotherapy entry-level training in Cameroon. Additionally, relevant stakeholders must develop strategies to extend the delivery of PLHP interventions beyond urban areas to rural and remote settings.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/ijerph21101386/s1, Supplementary File S1: The survey, File S2: Topic guide for the second phase, and File S3: The complete quantitative and qualitative results.

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6.3 Supplementary information

This section includes a more detailed exploration of salient points from study 4. These points were highlighted in the published article, but word count limitations limited the discussion. Issues that warranted expansion and further discussion are;

- Reasons for attending physiotherapy
- Challenges with mixed methods study
- How the study informed the research programme.

6.3.1 Reasons for attending physiotherapy

The findings reveal varied reasons for seeking physiotherapy among pwCVD. Both quantitative and qualitative data emphasize that CVD and associated risk factors were the primary reasons for initiating physiotherapy. Conversely, trauma and musculoskeletal conditions, among other issues, were more frequently cited as the main reasons for consulting physiotherapists, with CVD-related factors being secondary concerns. Quantitative results indicate that stroke accounted for 93% of CVD cases and was linked to multiple lifestyle risk factors, which were shared with individuals not identified as having CVD. This supports Dean and Söderlund's assertion that lifestyle behaviour changes are essential for patients with musculoskeletal conditions, encompassing factors such as smoking, unhealthy diets, excessive weight, poor sleep, and unmanageable stress (Dean et al., 2016; Dean & Söderlund, 2015).

Understanding the influence of lifestyle risk factors on health is vital for guiding assessments, public health messaging, and education. This comprehensive perspective goes beyond addressing illnesses or therapeutic interventions alone. For example, smoking negatively impacts general health, exercise capacity, and the musculoskeletal system, with prolonged smoking linked to bone thinning, fractures, delayed healing, and increased complications following trauma (AL-Bashaireh et al., 2018; Dai et al., 2021; Pignataro et al., 2012). Additionally, high caffeine and alcohol intake, often associated with smoking, exacerbates bone loss (Chen et al., 2022). Obesity is also closely linked to various musculoskeletal conditions, such as osteoarthritis and back pain, which impair functional capacity and not just CVD (Busetto et al., 2018; Rinonapoli et al., 2021).

Strong evidence supports the role of physiotherapists in delivering lifestyle interventions, not only for patients identified with CVD risk factors but also for those with broader health concerns (Bodner & Dean, 2009; Frerichs et al., 2012). Lifestyle interventions can significantly enhance musculoskeletal health, cardiovascular and pulmonary function,

and overall functional capacity. These interventions contribute to improved healing and repair processes, bolster systemic and local immune responses, and reduce inflammation (AL-Bashaireh et al., 2018; Dai et al., 2021; Pignataro et al., 2012). This highlights the importance of awareness and comprehension of lifestyle interventions among physiotherapists in Cameroon to address health issues in practice beyond CVD adequately.

6.3.2 Challenges with Mixed Methods Study

Conducting a methodologically sound mixed methods study presents numerous challenges. Chapter two, section 2.4.3, explores the full mixed methods design. The sequential explanatory design, data integration, rigour in mixed methods, and strategies to ensure the quality of the findings are reported under the relevant sections in 2.4.3. This section outlines some of these challenges and the strategies employed in this study.

First, designing a study that effectively integrates qualitative and quantitative approaches is inherently complex (Halcomb, 2019). This challenge was mitigated by developing a detailed research plan that clearly outlined the purpose and application of each method. For example, while quantitative methods were used to assess factors influencing the engagement of pwCVD in PLHP, qualitative methods were better suited to explore their preferences and experiences within the study. To facilitate this integration, the research team included experts in both quantitative and qualitative methodologies.

Second, integrating and interpreting different data types posed another significant challenge, particularly when conflicting results emerged between quantitative and qualitative findings (Dawadi et al., 2021). The research team addressed this through triangulation and thorough discussions to explore discrepancies and identify possible explanations.

A further challenge was navigating the theoretical and paradigmatic tensions inherent in mixed methods research. The divergent philosophical underpinnings of qualitative research (constructivism) and quantitative research (positivism) can create a risk of favouring one paradigm over the other (Dawadi et al., 2021; Kaushik & Walsh, 2019). To address this, the study adopted a pragmatic paradigm, prioritising the research questions over strict adherence to a particular philosophical framework. This approach allowed the study to draw on insights from both paradigms, enabling a more comprehensive understanding and the development of actionable recommendations to enhance overall PLHP practice in Cameroon.

6.3.3 How the study informed the research programme.

This mixed-methods study provides an in-depth overview of the perspectives and perceptions of pwCVD regarding PLHP in Cameroon, directly addressing the fourth objective of the research programme. The quantitative findings revealed a significant burden of CVD and risk factors among individuals receiving physiotherapy, highlighting an opportunity for physiotherapists to contribute to reducing this burden in Cameroon.

The qualitative data yielded three main themes: 1) the perspectives and experiences of pwCVD with PLHP, 2) the perceived usefulness and acceptability of PLHP, and 3) preferred methods for delivering PLHP. Participants also discussed factors influencing their engagement and adherence to PLHP interventions, including the nature of the interventions and preferred delivery methods. These insights from pwCVD are critical to the research programme's broader goal, as they illuminate the strengths and limitations of PLHP, offering essential guidance for designing sustainable and relevant interventions.

This approach aligns closely with translational science principles and is strongly supported by the Joanna Briggs Institute (JBI) model for evidence-based healthcare (EBHC) (Jordan et al., 2019; Pearson et al., 2012). According to the JBI, EBHC requires healthcare decisions to consider interventions' feasibility, appropriateness, meaningfulness, and effectiveness (Jordan et al., 2019). The perspectives of pwCVD are essential in assessing whether PLHP is appropriate and meaningful, making these findings instrumental in shaping the final recommendations of this research programme.

6.4 Chapter Summary

This chapter reports on the mixed method study among pwCVD, highlighting their perspectives and perceptions of PLHP in Cameroon and addressing the fourth research programme objective. The chapter begins by introducing the study's sequential explanatory nature and publication date. The full publication is reproduced with permission of the publisher. Some challenges associated with mixed methods studies and how they were addressed or mitigated are reported. Lifestyle factors were also examined as a common cause for CVD and other musculoskeletal conditions, advocating for a more holistic approach to health messaging and education. The chapter rounds up the contributions of the study to the entire programme of research. The next chapter discusses the key findings and reports on the recommendations derived from the research programme.

Chapter Seven: Discussion of Key Findings with Recommendations for Practice

7.1 Introduction

This chapter summarises the key findings from the research programme. It commences with a summary of the key findings from the published outputs and their respective programme objectives. This chapter provides recommendations to improve the scope, competence, and practice of PLHP for pwCVDs in Cameroon to better address the burden of CVD and risk factors. These recommendations are divided into three key areas: clinical practice, public health interventions, and training initiatives based on the data generated from the research programme and supplemented with relevant literature. Recommendations for future research are also included. This chapter addresses the overarching aim of the research programme (Section 1.8).

7.2 Summary of Key Findings

The overarching aim of the research programme was to generate data that informed the development of recommendations that can improve the capacity, reach, and effectiveness of PLHP services in Cameroon. This was carried out in four linked studies supplemented with up-to-date literature that adequately addressed all the research programme objectives. These studies included a systematic scoping review (Study 1) on PLHP strategies using the Template for Intervention Description and Replication (TIDieR) framework. The scoping review (chapter 3) addressed the first programme objective (Section 1.8) with the following key findings. A heterogeneous range of patients, including those with stroke, coronary artery diseases, peripheral artery diseases, hypertension, diabetes and multiple CVD risk factors, were investigated in the 20 studies included in the review. Based on the data, PLHP strategies are focused more on exercise and physical activity to address sedentary behaviour with education and counselling sessions. Other HP activities, such as education on lifestyle, diet/nutrition, self-management and home programmes were included in the PLHP interventions in a limited and inconsistent way. Other HP components, such as sleep, smoking and alcohol, were not covered in the literature. Health behaviour change theories and techniques were not commonly used to support positive health behaviours. Out of the included studies, fewer studies (10%) emanated from LMICs and none from the African continent. The review findings demonstrate the limited nature and investigation of PLHP activities globally,

particularly in Africa, and provide a justification for undertaking a further programme of research to investigate the nature of HP by physiotherapists in Cameroon.

The second study, a survey evaluating current practice and factors influencing PLHP practice in Cameroon (see Chapter 4), addressed research programme objective 2 (section 1.8) and provided the following key findings. Cameroonian PTs reported high levels of HP practice across several components, including weight management, dietary advice, physical activity, smoking cessation, stress management and sleep promotion. However, they consistently reported lower confidence levels in delivering all HP activities for pwCVDs. The majority of respondents delivered HP messages verbally, rarely using printed or written advice. Respondents reported that strong professional beliefs, high confidence in interventions, supportive teams, and favourable working conditions potentially enhance HP practice. Conversely, entrenched beliefs in using passive interventions, poor patient adherence, and systemic challenges such as the availability of guidelines, role ambiguity, poor referral pathways and limited training opportunities may limit HP practice. The study highlights the complex skill set that PTs require to effectively address the multifactorial needs of pwCVDs by identifying different areas, awareness, and factors affecting HP practice. The findings of this survey provided a superficial understanding of HP practices amongst physiotherapists in Cameroon and pointed to the need for a greater in-depth understanding of Cameroonian Physiotherapists' perspectives on HP for pwCVD.

Study three was a qualitative study that assessed the practice, confidence, and perceptions of physiotherapists regarding PLHP for pwCVDs (see Chapter 5) and addressed research programme objective three (Section 1.8). The key findings from this qualitative study of 16 Cameroonian physiotherapists included a wide acceptance that a broad range of HP practices fall within their scope of practice. Participants reported confidence in recommending exercise, physical activity, and diet as key components of HP under their purview. However, the majority reported feeling less confident about delivering advice about smoking cessation, sleep hygiene, alcohol and stress management. Participants were unaware of relevant behaviour change strategies and approaches that were in line with contemporary evidence. Participants reported employing limited objective assessment and monitoring instruments for various conditions in clinical practice. The findings of the previous survey and this qualitative study provided an in-depth understanding of HP practices, confidence to deliver HP activities and the training needs of physiotherapists in Cameroon.

The final study, a mixed methods study on the perspectives and perceptions of pwCVDs on PLHP in Cameroon (see Chapter 6), addressed the fourth research programme objective (see Section 1.8). Qualitatively, three main themes were identified and included: (1) perspectives and experiences of people at risk or with CVDs (pwCVDs) on PLHP; (2) perceived usefulness and acceptability of PLHP; (3) preferred delivery methods of PLHP. People at risk of, or with established CVD reported positive perceptions and experiences of physiotherapists in Cameroon delivering a variety of HP components with wide acceptance of PLHP interventions. However, pwCVDs also reported unmet needs related to service provision, personalisation, and tailoring of PLHP interventions. Some PLHP components, especially physical treatment and dietary advice, were deemed highly useful and acceptable.

7.3 Recommendations

The findings of the four studies summarised in Section 7.2 provided a clear understanding of the physiotherapist's and pwCVD perspectives of PLHP in Cameroon. It has identified the HP practices capabilities in key areas, including weight management, dietary advice, exercise and physical activity, smoking cessation, stress management, and sleep promotion and identified pwCVDs acceptance of PLHP. However, concerns around confidence delivering on components beyond exercise and physical activity, as well as limited training and resources on HP, were also identified. Consequently, the findings of these studies have informed 19 recommendations for developing PLHP in Cameroons, as summarised in Table 7.0. These are as follows: clinical practice, public health interventions, and training initiatives.

Table 7.0 Evidence-based Recommendations to Improve PLHP in Cameroon

SN	Recommendations	Research output(s) informing recommendation
A	**Clinical Practice Recommendations**	
1	Integrate Comprehensive HP in Physiotherapy Practice	*S1-4
	Broaden HP Scope	S1-4
	Collaborate Across Health Disciplines	S1, S3 & S4
	Set Clear HP Goals in Patient Care	S2 & S4
2	Enhance Culturally Adapted HP Interventions	S3&S4
	Customise PLHP for Individuals and Cultural Relevance	S3
	Promote Role-Modelling	S4
3.	Address Patient-Specific Barriers to HP Participation	S1, S3 & S4

	Use Patient-Centred Communication and behaviour change strategies	S3
	Increase Accessibility of Services	S1 & S4
B	**Public Health Interventions**	
1.	Raise Awareness and Promote the Role of Physiotherapy in HP for CVDs	S2-4
	Public Awareness Campaigns	S4
	Support from Health Authorities	S2 & S3
2	Increase Access to PLHP Services	S1, S2 & S4
	Community-Based Programs	S1 & S4
	Develop Partnerships with Non-Profits and NGOs	S2
3	Support a National CVD Prevention Strategy Led by Physiotherapists	S2-4
	Health Promotion Policy Development	S2 & S3
	Implement Standardised Metrics for PLHP Outcomes	S2 & S4
C	**Training and Capacity-Building Initiatives**	
1.	Provide Specialised Training on HP for Physiotherapists	S2 & S3
	Training in Evidence-Based HP Approaches	S2 & S3
	Address Knowledge Gaps in Specific Areas	S2 & S3
2	Develop Culturally and Contextually Relevant HP Curricula	S2-4
	Integrate Local Health Contexts in Training	S3 & S4
	Encourage Peer Learning and Mentorship	S2
3	Promote Research and Evidence-Based Practice in HP	S2 & S3
	Encourage Practitioner-Led Research:	S3
	Establish CPD Requirements	S2 & S3

*S1: Study 1, S2: Study 2, S3: Study 3, S4: Study 4, HP: health promotion, CVD: cardiovascular disease, CPD: Continuous professional development, PLHP: physiotherapy led health promotion

7.3.1 Clinical Practice Recommendations

1. Integrate Comprehensive Health Promotion (HP) in Physiotherapy Practice

a) Broaden HP Scope: Physiotherapists should adopt a multidimensional approach to HP interventions, addressing not only sedentary behaviours but also nutrition, smoking cessation, alcohol reduction, and mental well-being.

Supporting evidence: The scoping review (Section 3.4) identified that most PLHP interventions focused on physical activity, and very few focussed on wider HP intervention delivery (Section 3.4); many physiotherapists were already delivering a cross-section of HP interventions, including providing dietary advice, smoking cessation

etc (Section 4.2, 5.3) but the majority lacked confidence in doing so (Section 5.3). Patients reported that they would be happy to receive advice on a range of HP activities from physiotherapists (Section 6.2) if they were appropriately trained (Section 6.2). This recommendation is further supported by the global call for physiotherapists as a non-invasive professional to develop the relevant competencies to address the epidemic of lifestyle conditions (Dean et al., 2011, 2014, 2015)

b) Collaborate Across Health Disciplines: Physiotherapists should foster effective collaboration with other healthcare professionals, such as dietitians, professional counsellors, medical doctors and other health specialists.

Supporting Evidence: The scoping review reported on multiple HP interventions in collaboration with other health professionals like nutritionists, counsellors and health technologists (Section 3.4). Physiotherapists in the Cameroonian context reported referring pwCVD to other specialists with no evidence of collaboration adequately meeting pwCVD needs and overcoming challenges in workplaces (Section 5.3). The necessity to collaborate was further highlighted by pwCVD, stating that physiotherapists cannot manage some of the medical risk factors like diabetes and hypertension (Section 6.2). Establishing clear pathways and collaborations is necessary to help physiotherapists address the more complex needs of pwCVDs with ease and more comprehensively. Increasing evidence suggests that effective collaboration improves communication, saves time, reduces duplication of effort, improves working relationships and provides a better experience for clients who use health and social care services (Alderwick et al., 2021; Fletcher et al., 2012; Morley & Cashell, 2017).

c) Set Clear HP Goals in Patient Care: Physiotherapists should engage pwCVDs in setting specific, realistic, and personalised health goals. This can also take the approach of shared decision-making in goal-setting and individualised HP plans that are developed and reviewed regularly.

Supporting Evidence: pwCVD identified that physiotherapists were not establishing working goals for therapeutic and HP purposes in clinical practice (Section 6.2). This was also confirmed by physiotherapists (Section 4.2). Beyond building good therapeutic relationships, establishing collaborative goals can empower pwCVDs, build accountability, and foster engagement in HP behaviours. It is imperative that physiotherapists liaise with pwCVDs appropriately, prioritising their preferences and values following informed collaboration (Bastemeijer et al., 2021; Tringale et al., 2022).

This is necessary to set realistic goals that meet patient needs and improve adherence to HP interventions (Bassett, 2015; Mahmood et al., 2023)

2. Enhance Culturally Adapted HP Interventions

a) Customise PLHP for Individuals and Cultural Relevance: Physiotherapists should tailor HP strategies to align with patients' context and cultural beliefs, as well as traditional practices where possible.

Supporting evidence: The qualitative study highlighted that it is easier to integrate HP activities into individuals' routines or contexts by slightly modifying behaviours. The adoption of more culturally resonant health messages familiar to pwCVD and adapting interventions to community beliefs can enhance patient receptivity and trust in the care process (Section 5.3). Drastic changes and the introduction of a completely new lifestyle tend to cause adherence issues. Strid and colleagues concluded that successful implementation of HP strategies should consider addressing obstacles and facilitating factors within context (Strid et al., 2022, 2023). However, adopting an HP practice using individually targeted lifestyle interventions with the understanding of individual and context can improve adherence and patient outcomes (Strid et al., 2023). Approaches such as storytelling and liaising with religious, cultural and community groups to provide education that can change behaviours and practices have been reported in Cameroon (Sikapa et al., 2024; *The Theory and Practice of Evidence Based Storytelling*, n.d.). Physiotherapy can collaborate and acquire these skills to properly to navigate cultural issues with improve health impact.

b) Promote Role-Modelling: Physiotherapists should act as role models for positive health behaviours, such as regular physical activity and balanced eating.

Supporting Evidence: The mixed methods study highlights that pwCVD has excellent working relationships and confidence in their physiotherapists (Section 6.2). Physiotherapists can have a profound influence on patient behaviour through modelling. Serving as role models not only reinforces the health messages delivered but also builds credibility and can inspire patients to adopt similar healthy habits (Lobelo & De Quevedo, 2016; Oberg & Frank, 2009). While relying on personal life experience is discouraged in the literature in favour of using evidence-based interventions, wide adoption of healthier lifestyle approaches among physiotherapists is strongly encouraged (Black et al., 2016; Kyle et al., 2017).

3. Address Patient-Specific Barriers to HP Participation

a) Use Patient-Centred Communication and Behaviour Change Strategies: Physiotherapy should use personalised communication strategies, such as motivational interviewing, in evaluating and conveying behaviour change interventions.

Supporting Evidence: The qualitative study highlights a significant lack of awareness and use of tailored behaviour change strategies among physiotherapists in Cameroon (Section 5.3). The poor understanding of behaviour change techniques and theories directly affects the quality of HP interventions (Bassett, 2015; Chester et al., 2023; Willett et al., 2019). Physiotherapists should be able to explore and intervene appropriately, respecting patient's unique differences and barriers, such as economic limitations, misconceptions about physical activity, and lack of access to safe exercise spaces, to provide more relevant and achievable alternatives and support (Bassett, 2015; Chester et al., 2023; Willett et al., 2019). Physiotherapists should gain competence to initiate, conduct and terminate health talks for health behaviour change intervention (Albury et al., 2019).

c) Increase Accessibility of Services: Physiotherapists should build confidence and competence in using telehealth and mobile health (mHealth) technologies to extend access to PLHP, especially for underserved populations in rural or remote areas.

Supporting Evidence: pwCVD strongly highlighted the lack of physiotherapy services in rural and remote areas in Cameroon (Section 6.2). pwCVD also reported poor communication and continuous monitoring after physiotherapy sessions (section 6.2). The scoping review reports on the use of technology-based interventions for pwCVD (Section 3.4). For instance, mobile interventions have been successfully used in weight management in rural older adults with obesity (Batsis et al., 2021). While the Cameroonian context may present its set of challenges, technology remains a viable way to increase access. The government is also responsible for scaling up the quality and quantity of physiotherapy training programmes in Cameroon to meet the needs of pwCVD nationally. (*Cameroon Society of Physiotherapy*, n.d.; *Physiotherapy Practice Startup, Cameroon*, n.d.).

7.3.2 Public Health Interventions

1. Raise Awareness and Promote the Role of Physiotherapy in HP for CVDs

a) Public Awareness Campaigns: Developing and launching public awareness campaigns can raise understanding among both the public and healthcare professionals regarding the role of physiotherapists in HP.

Supporting Evidence: The mixed methods findings highlight the need for public sensitisation on HP for pwCVD (Section 6.2). Participants cited that physiotherapists should work with the government to implement policies for public awareness and education on health issues based on national statistics. pwCVD emphasised that public health interventions should be strengthened through mass media like the national radio and television in Cameroon. This aligns well with the call for physiotherapy professionals to raise awareness of lifestyle-related conditions, given the staggering statistics of the NCD epidemic globally (Dean et al., 2011, 2015, 2016).

b) Support from Health Authorities: Collaborating with health authorities and policymakers to officially recognise physiotherapists' contributions to HP is critical.

Supporting Evidence: The survey highlights institutional and community/public factors that influence HP practice (Section 4.2). Physiotherapists report the absence of regular training, poorly organised practice, role ambiguity and poorly established referral pathways. The absence of public and clinical guidelines on CVD in the Cameroonian context calls for key stakeholder support and collaboration. In the qualitative study, participants also alluded to a lack of funding and the potential benefits of non-governmental organisations' involvement in HP (Section 5.3). Additionally, wider evidence suggests that collaboration between healthcare organisations can improve health impact and outcomes, given it is understood within the macro-level political and economic context (Alderwick et al., 2021).

2. Increase Access to PLHP Services

a) Community-Based Programmes: Establishing accessible, community-based PLHP programmes that provide CVD screenings, educational workshops, and group activities led by physiotherapists can significantly expand reach. This could potentially be introduced as expansion or modification of existing public and clinical health services to maximise funding.

Supporting Evidence: The mixed methods findings highlight the need for community-based programmes (Section 6.2). pwCVD desires access to physiotherapy services, monitoring and support beyond normal sessions. This is even more compelling in rural and under-resourced areas. The only viable way to achieve this is through community-based programmes, which can be led by physiotherapists in Cameroon with patient groups or community leaders. The scoping review also demonstrated the acceptability of technological-based interventions in rural areas (Section 3.4).

b) Develop Partnerships with Non-Profits and NGOs: Partnering with non-profits and NGOs can help sustain and expand HP services for financially disadvantaged individuals, particularly in rural or underserved regions.

Supporting Evidence: The qualitative findings highlighted funding as a challenge to initiating and sustaining HP intervention both public and private settings (Section 4.2). Partnering with funders and other non-health organisation may be viable way to extend the reach, and sustainability PLHP. The mobile communication companies, ORANGE and MTN could be potential partners for funding and technological support to deliver HP messaging in Cameroon.

3. Support a National CVD Prevention Strategy Led by Physiotherapists

a) Health Promotion Policy Development: By collaborating with the Ministry of Public Health and public health organisations, physiotherapists can advocate for including PLHP in national CVD prevention strategies.

Supporting Evidence: The survey and qualitative findings highlighted the absence of the Cameroon Society of Physiotherapy in national issues (Sections 4.2 and 5.3). It is imperative that physiotherapists should lead on national issues to develop policies and programmes that improves health and represent their professional values. Such advocacy could establish a formal framework for PLHP and could set a precedent for CVD prevention across Cameroon.

b) Implement Standardised Metrics for PLHP Outcomes: Developing a system of outcome metrics to evaluate PLHP effectiveness is essential for ensuring consistency and accountability across healthcare settings. The development and implementation of prevention guidelines could improve practice among physiotherapists in Cameroon.

Supporting Evidence: Evidence supports that assessing health behaviours should precede or accompany BIs in physiotherapy (Connor et al., 2023; Hoogeboom et al., 2014; Veras et al., 2016). However, data from both pwCVDs and physiotherapists show that behaviour assessments are not routine, even though they reported providing BI on HP components routinely (Sections 4.2 and 6.2). Specific health assessment tools and outcome measures were notably absent across all studies, reflecting a broader issue in the profession. Documenting the intervention's specifics (e.g., optimal intensity, methods, and adherence) alongside its outcomes is essential to proving measurable change. Findings from this research program reveal that current practices may limit data collection, thus underutilising opportunities to demonstrate impact. Tracking outcomes can provide insight into the success of interventions and inform future program

improvements. Studies indicate that awareness of personal behaviour levels is a critical precursor to behaviour change (Bull et al., 2019; Evans & Stewart, 2015).

7.3.3 Training and Capacity-Building Initiatives

1. Provide Specialised Training on HP for Physiotherapists

a) Training in Evidence-Based HP Approaches: Training programmes focused on evidence-based HP approaches, such as motivational interviewing, goal setting, and behaviour change models, can help physiotherapists build confidence and competency in delivering effective HP interventions.

Supporting Evidence: The survey findings demonstrate physiotherapists engage in HP for pwCVD across several components (Section 4.2). The qualitative study expanded on the findings, demonstrating the absence of evidence-supported interventions for HP (Section 5.3). Broader literature suggests that providing information for real-life behaviour change is insufficient without considering the complex factors that drive behaviour change (Bassett, 2015; Chester et al., 2023). There is growing evidence that about a quarter (26.3%) of Cameroon conduct evidence-based practice, and slightly more than half (55.4%) appear to have a good understanding of research terminology (Muntessu et al., 2024). There is a compelling need to provide relevant evidence-based training to empower physiotherapists to meet the HP practice standards of pwCVD in Cameroon.

b) Address Knowledge Gaps in Specific Areas: Training should include topics that are commonly under-addressed, such as alcohol reduction, mental health, and sleep hygiene, allowing physiotherapists to address a broader range of CVD risk factors comprehensively. This can be introduced through curriculum change and specific continuous professional development courses during practise.

Supporting Evidence: All the studies demonstrated that physiotherapists focus on HP practice around exercise and physical activity. The survey and qualitative findings (Sections 4.2 and 5.3) demonstrated a lack of knowledge on relevant HP components such as alcohol use, smoking, and sleep, among others. It is necessary that physiotherapists under the physiological impact of these components and how they can be assessed, addressed and monitored. This is in line with the call for physiotherapists to expand their scope of practice and develop relevant competencies to tackle better the NCD epidemic, including CVD (Dean et al., 2019; Dean et al., 2014, 2016)

2. Develop Culturally and Contextually Relevant HP Curricula

a) Integrate Local Health Contexts in Training: Designing training curricula that incorporate cultural insights and address the unique health challenges faced by the Cameroonian population ensures that physiotherapists are equipped to deliver culturally sensitive care

Supporting Evidence: The qualitative findings highlight gaps in entry to practice training for physiotherapists in Cameroon on HP (Section 5.3). The mixed methods findings demonstrate the desire of pwCVD to have HP interventions delivered in ways that recognise the social and economic realities of Cameroon (Section 6.2). Considering contextual factors that can act as barriers and challenges to effective HP and strategies that can overcome them in training practice is essential for contemporary curricula in physiotherapy. It is necessary to develop and deliver training programmes that meet the required competencies of professional practice (Dean et al., 2019).

b) Encourage Peer Learning and Mentorship: Establishing mentorship and peer learning networks can support ongoing professional development for physiotherapists.

Supporting Evidence: The survey findings demonstrate support from colleagues was one of the key interpersonal factors enhancing HP practice among physiotherapists (Section 4.2). These opportunities promote the sharing of best practices and reinforce new skills among practitioners. While peer learning and mentorship offer a wide range of benefits, including personal, relational and organisational, there is no evidence of such growing collaboration in Cameroon. Yoon and colleagues demonstrate valuable perspectives of physiotherapist mentors in Canada. They highlight the need for support from professional associations, institutions, and physiotherapists to improve mentorship experiences (Yoon et al., 2017).

3. Promote Research and Evidence-Based Practice in HP

a) Encourage Practitioner-Led Research: Supporting physiotherapists in conducting local research on HP allows them to identify specific community needs, evaluate intervention outcomes, and develop best practices based on local evidence.

Supporting Evidence: The qualitative data demonstrate a lack of evidence-based training among physiotherapists in Cameroon (Section 5.3). Muntessu and colleagues reported poor knowledge of and a low level of practice of evidence-based practice, despite an overall positive attitude towards it (Muntessu et al., 2024). Poor research training, study facilities, mentorship, research infrastructure, and funding issues have also been

identified as local barriers to undergraduate medical students in Cameroon (Ngeh, 2019). There is a need for CASP, the Ministry of Public Health, and other stakeholders to encourage and develop strategies to improve research among physiotherapists.

b) Establish Continuing Professional Development (CPD) Requirements: Mandating HP training within CPD requirements ensures that physiotherapists stay updated on the latest HP strategies, sustaining high standards of care for CVD prevention

Supporting Evidence: The findings of the survey and the qualitative studies consistently highlight the lack of consistent training relevant to physiotherapy professional practice in Cameroon (Sections 4.2 and 5.2). It is important that physiotherapists and the physiotherapy society take full responsibility for enabling more consistent training so that practitioners can stay up to date with the latest cost-effective strategies and interventions for pwCVD in Cameroon. This is an essential requirement of the physiotherapy profession in the 21st century (Dean et al., 2019; Dean et al., 2011).

7.4 Shifting Physiotherapy Focus to Prevention

To address the significant shifts in population health, it is crucial for the physiotherapy profession in Cameroon to adapt both its identity and its interventions. The qualitative and mixed-methods study findings indicate that the medical model continues to shape physiotherapy practices. Moving beyond this model could encourage the development of a more relevant professional identity, positioning physiotherapy to better meet the demands of contemporary healthcare. By embracing a broader understanding of health, physiotherapy services could shift their focus from solely treating disease to promoting health more comprehensively (Dean, 2009).

This evolution in professional identity offers physiotherapists in Cameroon a pathway to align more closely with international standards and progressive healthcare models while acknowledging the unique challenges of the local context. Embracing change can provide an opportunity for the profession to redefine itself and take proactive steps to strengthen its role in healthcare. This requires leadership within the profession to critically examine and challenge existing assumptions about health and the factors that contribute to it. By developing skills in recognising and responding to changes in health needs, physiotherapy leaders can ensure the profession is equipped to play a pivotal role in supporting population health (Whitehead et al., 2001).

It is recommended that professional leadership within physiotherapy in Cameroon encourages a shift in focus, fostering an understanding that improving health outcomes

requires addressing a range of determinants beyond immediate physical complaints and impairments. This means considering factors such as education, health literacy, self-efficacy, and social connections that influence long-term health. By adopting a professional identity that actively promotes health in its broadest form, physiotherapy in Cameroon can adapt to the evolving health needs of the population, better address resource constraints, and secure its role as a key contributor to holistic health and well-being (Hargett et al., 2017; Hunt, 2024).

7.5 Strengths and Limitations of the Research Programme

The specific strengths and limitations of each method are examined in the published papers and their corresponding chapters, while the overall strengths and limitations of the research program are assessed here. This study marks the first in-depth investigation of multiple aspects of PLHP and practices in Cameroon, advancing knowledge of current practices and highlighting areas for future development. Until now, the potential for physiotherapists to help reduce the burden of CVDs has been largely under-recognised in Cameroon.

The study employed research methodologies rooted in pragmatism to address complex research questions. Contemporary guidelines were utilised for the development, execution, and reporting of scoping reviews, surveys, qualitative studies, and mixed-methods research. At each stage, sufficient participants were recruited to ensure the desired quality and rigour of the research outputs. The study's transparent reporting aligns with best-practice guidance for developing complex interventions. Additionally, the inclusion of four research outputs with already three peer-reviewed publications underscores the research quality, reporting standards, and relevance of the topic.

This research has benefited from collaborative efforts from hospital administrators, CASP, individual physiotherapists in Cameroon and a solid research supervisory team. These have enhanced its relevance and positively influenced the quality of the outputs, including recruitment and response rates. Three peer-reviewed articles have been published in reputable journals, offering timely that can inform practice within the broader research and clinical communities.

The author's influence within the field in Cameroon is acknowledged, recognising both its positive and potential negative impacts on the research process. The researcher's influence on the research process through positionality, worldview, and relationships with participants are reported in chapter two, section 2.5. Personal attributes, professional background, and insider status shaped access, participant dynamics, and data

interpretation. Strategies like reflective journaling, supervisory debriefs, and transparent audit trails mitigated these potential biases.

One limitation of the research programme was the lack of funding to enhance data collection from the 10 regions of Cameroon. Even though more than 80% of Cameroon physiotherapists practice in the four regions (cities) where the data was collected, a wider coverage could have been more representative of the entire country. The realities and practice of physiotherapy in the other regions are likely to be different with implications for futures studies with a wider coverage and research methods.

7.6 Recommendations for Future Research

Based on the literature and findings that inform the recommendations, research gaps have been identified. Further research using different approaches is warranted to test the recommendations and better inform HP strategies and interventions. The following recommendations have evolved from the research programme findings and broader literature.

1. It is necessary to develop and test pragmatic, physiotherapy-specific BIs that integrate seamlessly into routine care.
2. Identify and validate core BCTs for use in physiotherapy-led interventions.
3. Explore fixed and adaptable elements of PLHP interventions to facilitate replication and context-sensitive implementation.
4. Investigate the impact of addressing clusters of behaviours to maximise health outcomes.
5. Prioritise interventions for underserved populations, ensuring equity in health promotion efforts.
6. Create locally relevant resources, such as assessment tools, educational materials, and technology-based interventions, to support physiotherapists' HP efforts.
7. Investigate factors influencing the sustainability and scalability of HP practices in the physiotherapy profession.

7.7 Chapter Summary

This chapter reviews and examines the main findings of the research programme. It discusses the programme's strengths and limitations, along with their potential impact. Based on these findings, the evidence-based recommendations to improve HP practice have been summarised here. Recommendations are broadly divided into clinical practice, public health, and policies. The chapter concludes with recommendations for future research.

The next chapter presents the conclusion of the research programme by providing an overview of the objectives, studies, and findings.

Chapter Eight: Conclusion

8.1 Introduction

This thesis, across eight chapters, has examined HP in physiotherapy practice in the context of Cameroon. It has outlined how contextual factors, including the political, social, and economic landscape, shape the rationale for this research programme, with insights from the perspectives of both pwCVDs and physiotherapists. A comprehensive literature review has situated this research within the current body of knowledge. Four interconnected studies using various research methods have been designed, conducted, analysed, and documented. The findings have been discussed and contextualised within existing evidence. Lastly, the implications of this research for clinical practice, public health, policy, research, education, and training have been thoroughly detailed.

8.2 Review Aims & Objectives

Four research objectives were defined in advance to fulfil the overarching research aim of providing guidance on PLHP and understanding the factors influencing current practices. Here, each objective is reviewed to assess its achievement.

Objective 1: To systematically map existing PLHP strategies for pwCVDs.

A systematic scoping review provides a published overview of the current evidence on PLHP strategies. It employs rigorous methods aligned with best practices for conducting scoping reviews. Reporting was transparent and followed established guidelines. The review was ultimately peer-reviewed and published in the *International Journal of Environmental Research and Public Health* (Chapter 3).

Objective 2: To examine current physiotherapy practices in HP for pwCVDs in Cameroon.

A national, cross-sectional survey provided a published account of current practices and factors influencing PLHP for pwCVDs in Cameroon. Findings from this survey informed the qualitative study in the later phase (Study 3). While this practical approach had limitations, these are thoroughly acknowledged in the method section. The study was peer-reviewed and published in the *Journal of Clinics and Practice* (Chapter 4).

Objective 3: To examine Cameroonian physiotherapists' competence and confidence in promoting health for pwCVDs.

Findings from the quantitative study (study 2) provided initial insights that were further explored in a qualitative study (study 3). The qualitative findings added depth to the quantitative results,

offering detailed perspectives on HP and context from physiotherapists. This qualitative study clarified complex quantitative findings on practices and confidence, followed robust methodologies, adhered to reporting guidelines, and was submitted for a peer-reviewed publication in the *Journal of Physiotherapy and Theory* (Chapter 5).

Objective 4: To explore the perspectives and factors influencing effective HP and adherence among pwCVDs.

This mixed-methods study involved a two-phase process. Phase 1 involved a survey with quantitative findings that guided an in-depth qualitative follow-up in Phase 2. The results from Phase 1 shaped the development of interview questions and informed the qualitative sampling in Phase 2, with the interface between the two phases detailed in Chapter 6. This work was peer-reviewed and published in the *International Journal of Environmental Research and Public Health* (Chapter 6).

Overarching Aim: To develop evidence-based recommendations for PLHP for application in low-resourced settings like Cameroon for pwCVDs

The 19 recommendations outlined in Chapter 7 are informed by collective findings from the scoping review, cross-sectional surveys, and qualitative follow-up studies. Recommendations for clinical practice and public health messaging are highlighted to inform future approaches and increase the likelihood of sustained impact.

8.3 Contribution of New Knowledge

This research programme has generated new insights across several key areas. First, **Study 1** synthesised global literature on PLHP strategies for pwCVDs, offering the most current overview of existing evidence; it uncovered previously unrecognised trends, including a small but expanding body of research, a predominant focus on exercise and physical activity, a lack of behaviour change theories and techniques in HP interventions, and limited evidence supporting practical interventions. Second, **Study 2** provided new insights into current practices among Cameroonian physiotherapists regarding HP in routine care for pwCVDs. It revealed patterns in clinical practice, documented previously unreported aspects, and preliminary findings on Cameroonian physiotherapists' HP habits, suggesting areas for further research. **Study 3** examined practising physiotherapists' perspectives on current practice, confidence, and training needs, offering explanatory context to findings from Study 2. This study contributed novel insights into the factors underlying HP in physiotherapy practice in Cameroon, revealing that focusing on short-term functional restoration often overshadows a more holistic HP approach. Lastly, **Study 4** captured the most comprehensive perspectives of pwCVDs,

highlighting broader factors that impact engagement and adherence to HP efforts. These insights are valuable for informing strategies to enhance HP in Cameroon.

8.4 Dissemination and Impact to Date

The impact of each publication is detailed in its respective chapter. Overall, this research programme has made significant contributions in several ways. Beyond publication in peer-reviewed journals, findings were presented as a platform presentation at the World Physiotherapy Conference in Dubai on June 2, 2023, and at the Global Evidence Summit in Prague, Czech Republic, from September 11, 2024. A pre-conference training on physical activity leadership was successfully conducted on June 1, 2023, in collaboration with leading experts cited in this thesis. This work also drew attention from notable collaborators, including Professor Elizabeth Dean, whose research has been widely referenced here. Together, our collaboration contributed to the development and publication of "An Unbiased, Sustainable, Evidence-Informed Universal Food Guide: A Timely Template for National Food Guides" (Dean et al., 2024), which provides a high-profile opportunity to contextualise findings globally and foster future collaborations. The findings have been summarised and shared with the CASP (Cameroon Society of Physiotherapy) executives, with ongoing invitations to capacity-building meetings and collaborations with stakeholders to improve the practice of PLHP and plan relevant training sessions.

8.5 Thesis Summary

This thesis presents a comprehensive, practical, and relevant research programme designed to examine and understand a modern public health intervention within physiotherapy. The findings indicate that physiotherapy in Cameroon remains primarily guided by a medical model, focusing on short-term functional recovery rather than long-term health improvement. Enabling the profession's evolving identity could drive service changes that embrace a more holistic view of health. Meaningful PLHP strategies that promote long-term behaviour change offer one pathway toward this broader goal. HP should be integral to physiotherapy practice, with treatment and management objectives that extend beyond functional recovery to consider how optimal long-term health can be achieved. Encouraging an evolving professional identity openly committed to HP could help reshape the role of physiotherapists, equipping them to meet the needs of a complex and evolving population. This thesis has outlined the methods used to achieve these objectives, collectively providing preliminary, evidence-based guidance for physiotherapy practice and exploring the factors influencing current practice patterns. In

meeting this primary aim, additional questions have emerged, which are discussed regarding their implications for education, research, policy, and clinical practice. This new knowledge will serve as a foundation for further research, discussion, and inquiry, ultimately supporting the continued growth and advancement of the physiotherapy profession in Cameroon and beyond.

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Appendices

Appendix 1: Study 2, Published Supplementary Files

Supplementary file Table S1

A

Do you ask your patients about their confidence to change or improve their habits in the following areas?					
	Never	Sometimes	Usually,	Always	
Alcohol intake	17%(n=29)	27%(n=45)	26%(n=44)	30%(n=51)	
Physical activity	9%(n=16)	22%(n=38)	32%(n=54)	37%(n=63)	
Diet	14%(n=24)	23%(n=39)	36%(n=62)	27%(n=47)	
Weight	16%(n=27)	23%(n=40)	28%(n=49)	33%(n=56)	
Sleep	20%(n=34)	35%(n=61)	26%(n=44)	19%(n=33)	
Stress management	16%(n=27)	32%(n=54)	22%(n=37)	31%(n=52)	

B

Do you discuss challenges patients may face while trying to improve in any of the following areas?				
	Never	Sometimes	Usually	Always
Physical activity	7%(n=12)	33%(n=56)	28%(n=48)	33%(n=56)
Diet	11%(n=19)	31%(n=51)	32%(n=53)	26%(n=44)
Weight	13% (n=22)	28%(n=48)	26%(n=44)	33%(n=56)
Sleep	24%(n=40)	31%(n=52)	26%(n=44)	20%(n=34)
Stress management	18%(n=31)	30%(n=51)	21%(n=36)	30%(n=51)
Alcohol	21%(n=35)	17%(n=45)	24%(n=41)	28%(n=48)

C

Do you assist your patient to know the optimal recommended values for?				
	Never	Sometimes	Usually	Always
Physical activity	11%(n=18)	46%(n=79)	23% (n=40)	20%(n=34)
Diet/nutrition	18%(n=31)	42%(n=72)	23%(n=39)	17%(n=29)

Weight	15%(n=25)	34%(n=58)	28%(n=47)	24%(n=4)
Sleep	22%(n=37)	42%(n=70)	23%(n=39)	13%(n=22)
Stress management	22%(n=38)	36%(n=61)	21%(n=36)	21%(n=35)
Alcohol intake	19%(n=32)	35%(n=59)	23%(n=39)	23%(n=39)

What is most (highest) common type of problems your see on daily basis? - Selected Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Orthopedic	70	38.7	38.7	38.7
	Neurological	76	42.0	42.0	80.7
	Cardiovascular and respiratory	1	.6	.6	81.2
	Pediatric (< 15 years)	4	2.2	2.2	83.4
	Geriatric (>65 years)	11	6.1	6.1	89.5
	Sport	5	2.8	2.8	92.3
	Others please, specify	14	7.7	7.7	100.0
	Total	181	100.0	100.0	

Appendix 2: Study 3, Published Supplementary Files

Supplementary File S1: TOPIC GUIDE

THANKS FOR ACCEPTING TO TAKE PART IN THIS STUDY

1. Can I start by asking you what health promotion means to you as a physiotherapist?
    - Your understanding of the term health promotion
    - In relation to practice
2. Do you practice health promotion to enable patients to improve or increase control over their condition or risk factors that can lead to CVD?
    - Frequently or rarely?
    - specific components of health promotion?
3. Please tell me more about which areas of health promotion in practice you feel comfortable engaging your patients?
    - Exercise and physical activity
    - Diet/nutrition
    - Alcohol, smoking and sleep counselling?
4. Why is health promotion practice important to you?
    - Prevention of diseases (primary, secondary and tertiary)
    - Improve clinical outcomes
5. What importance does health promotion hold in your practice?
    - Valuable component of your practice?
6. Do you generally assist patients with strategies to adopt and maintain new habits? If yes, what are some of the habits and strategies?
    - Which components?
7. Where you work, are there any barriers which make health promotion difficult?
    - Individual (knowledge, training, time …)
    - Environmental (resources, space…)
    - Institutional (guidelines, collaborators, mentors...)
    - Systematic (National and international guidelines…)
8. How competent are you in delivering health promotion activities for pwCVDs?
    - Understanding of what to do in each case based on your training/knowledge
9. To what extent do you feel competent at delivering health promotion activities for pwCVDs?
    - Confidence
10. How did you gain such competence?
    - During training
    - Clinical placement
    - CPDs
11. Are you aware of cognitive behavioral interventions, strategies, and therapists? If yes, please tell me more about how you employ that into health promotion practice.
    - Theory to aid in behavior change
    - Specific strategies
12. Are you comfortable assessing lifestyle and behavior changes for a patient? If so, can you give me some practical examples of doing this?

- Specific outcomes measures
- What you do in routine practice

13. Do you generally discuss challenges patients may face while trying to improve in any areas? If so, can you give me some practical examples of doing this?
    - Resources
    - Providing best evidence and options
14. Are there any theories or concepts you employ when guiding you to assess your patient's willingness to engage in proposed changes?
    - Adopted pattern for routine practice
    - Specific techniques
15. Do you generally assist your patient to know the optimal recommended values or best practice guide for any area of intervention you propose? Which sources do you use for this information?
    - Physical activity
    - Sleep
    - Alcohol
    - Weight
16. Any questions or last word for me?

BEFORE WE FINISH, IS THERE ANYTHING YOU WOULD LIKE TO ADD

WE'LL FINISH HERE – THANKS FOR TAKING PART

Supplementary file Table S2: Final themes and categories on the PLHP practice and perceptions among Cameroonian physiotherapists with example reference (quotes) (n=16)

Dimensions	Higher order themes	Lower order themes	files	References	Sampled reference (quotes)
Perceptions of PT role in HP	Professional role of PTs	Scope of practice	11	20	*"It is important because the health promotion goes with the physiotherapy. You offer it because it's going to help people get more from what they are already getting. And especially in the private practice, you need them to come back. You need them to refer people. So, you need that your service is better than the regular service anywhere else"* P6 *"But from my part, education is part of, but it becomes difficult when you enter another field which is not yours. Diet and nutrition are separate, so it is not easy for somebody, someone, to enter somebody's field. So, we just do what we can do to help your patient"* P9.
		Prevention of diseases and disabilities	14	37	*"Yes, it's very important. It's not all about managing diseases but trying to get the patients and family to stay healthy and not frequent in the hospital with disabilities and diseases. So, it's always practiced, I think, is part of our practice in the public health in this country"* P13 *"Yes, most patients that come here maybe post-stroke; we start by educating and monitoring certain biochemical processes in the system like cholesterol level and triglycerides because those are the risk factors that can lead to a second stroke, which is very dangerous. Advise most of the patients that there is a probability that having the second stroke is very possible"*. P6 *"To me I think it's important because it will help to improve the health of the patient in the long term, not only at the clinic, but even after and also it would delay the occurrence of a new disease"* P10.
Current practice of PLHP	Areas of current practice	Assessing lifestyle	12	27	*"I follow the conventional way of assessing a patient as you start with the demographic data, past medical history and all of that. Once I go through that procedure. I established the diagnosis. Yes, that's how I do that. I follow the conventional way of assessing the patient, and then that's how I get to a conclusion on what the patient is suffering from", P7.* *"Absolutely, all patients that pass through the clinic we take their BMI of all the patients. We know the importance of obesity as a risk factor for cardiovascular diseases, even neurology or many other systems in the body" P4.*
		Exercise and diet	14	37	*"So, we advise patients a lot on exercises and on diets. Because if you see the world today, many patients end up becoming overweight or hypertensive at a very young age. So, to avoid that, we advise patients a lot on their diet and regular exercises" P1.* *"I think here at our health institute, we mostly talk about exercises, we also talk on diet because certain diet, we try to explain to the patients the importance of diet to be nourished and to avoid certain complications" P2.*
		General advice and counselling	13	29	*"With blood pressure, for example, at any time the patient visits, the blood pressure is taken. If it's too high compared to the last time, then we need to sit the patient down and talk, what is happening? Why has your blood pressure gone up? What changed from the last time? How has your diet been? With all of that we can understand how to better manage the patient" P1.*

					"But the area that sometimes I feel comfortable with patients is mostly when counseling them, especially a patient with severe pain, I know that what I'm doing is just one-third of what can be done to help the patient. So sometimes I educate patients on the positions that aggravate and relieve their pains. Sometimes I educate them, but I do lay emphasis on nutrition" P11.
		Referrals and multidisciplinary collaboration	7	11	*"If patient ask me, information about nutrition, generally I will give to the patient basic knowledge. But when they want deep knowledge, I'll send them to a nutritionist. That's what I do, when the patients tell me, for instance, that I'm not sleeping, I will ask why? Are you stressed up, are you eating very well? But I'll send it to a nutritionist for checking",* P10. *"Yes, health care naturally, I don't know how to put it is supposed to be a holistic care. We all have a part to play, so it's not one person. I'll be giving health promotion with respect to aspects that might be related to physiotherapy and nurses will have theirs with respect to hygiene and sanitation. The doctors have theirs with respect to medications and all of that. So, all together if we put our heads, hand in gloves, then we are going to help the patients better. It's important that all medical personnel work together in every aspect of a particular disease, for example, diabetes and all of that, to get to give the best of care to the patients"* P10.
		Smoking, sleep and alcohol	13	22	*"For example, the one that are very stressed by the work, normally those persons are not sleeping. They don't sleep, they sleep very late, and they get up very early and those habits have effects on their health and the ability to act well or to respond well. When you don't sleep well, you are very, very sensitive to many things around you", P12.* *"I think the first, no, the answer is no because a lot of people will not be honest about that. They are not always about the alcohol consumption. They are not honest about smoking", P5*
	Challenges	Workload and time	8	23	*"There are barriers among which are sometimes you get so pressured that you just want to administer the treatment, call in the next patient, sometimes that time to really sit and interact with the patient and the family, sometimes it's difficult, but sometimes we just prioritize the treatment of the patient"* P11 *"Time is a barrier because most of them, since I deal with handicapped people, they may have a driver. The car can be a taxi and when the taxi comes, the driver will not wait. I don't have opportunity to move from house to house, because it's not really my job",* P9.
		Education and Training	9	26	*"As a physiotherapist, I will not say that it's has been really too much part of my formation or my training" P5.* *"Yes, the national society does contribute. And the problem is it happens rarely. It can be like once annually mostly towards world physiotherapy day when you have celebrations. Yes, but to say let's plant something it's very rare", P1*
		Lack of resources	12	37	*"Yes, I think we have SOP that guides you to educate patients in some pathologies. SOPs for example any other thing apart from cardiovascular diseases. We have SOPs on how to cancel people with TB, HIV and all that on health promotion and other aspects of their lives. There are for different pathologists, but for cardiovascular disease, specifically, I don't think I found one, but for these diseases that are under programs in the country, they have SOPs, standard SOPs", P13.*
		perceptions of patients	13	35	*"Now, some prefer their gender, if it is a man, the man, will prefer to talk to a man. If it is a woman, the woman we prefer to talk to the woman. If it's a mother, I think that they don't care if it is a man or a woman. When they are very aged, they don't care about the gender of the therapist they just pull*

					out." P11 *"I don't know whether it's a cultural thing, but I look at it as it's not really my field, and it's kind of private when they open, I'm ready. But if they do not open, I don't poke. Yes!"* P5.
	Training needs	Behavior change approaches	11	27	*"I am not aware of any specific, cognitive or behavioral intervention, but I've implemented some behavioral changes. For instance, if you want to reduce weight, don't eat too many meals in a day, eat at a given time in a day. If you say you eat 2 times a day, don't eat in between those 2 times, don't eat too late. At night, if you know you're about to sleep at 9 or 10 pm, try to take your last meal around 6:00 pm, you make that persistent. But now about a particular cognitive behavioral pattern. I don't yet know about that".* P14
		Basics on health education	12	22	*"Now, I know that I also have to learn more and do better as far as health promotion is concerned, because I never thought of it as something I really have to take serious",* P15. *"Time is not a barrier, but I only use my basic knowledge to educate patients. I do not have any document or support that I can use",* P16.
		Assessing lifestyle behavior	13	36	*"For lifestyle just by asking their usual habits is the main way for me to assess it. And, for behavior change, no, I don't really assess the behavioral change. I don't have the skills to assess that".* P3.
Competence in delivering HP for pwCVDs	Level of competence	Perceived as moderate	10	16	*"I am more confident, mostly in physical activity. Yes, stress management that's counseling. I try to do counseling as much as possible". P2* *"I feel confident and competent because I'm a physiotherapist course instructor, teaching physiotherapy in cardiovascular and respiratory systems. By doing that, we explored a lot of documents, textbooks and so with what, I have acquired and what I share with the student, it gives me some leverage to be able to transmit that to my patient or to other individuals", P14.*
		Perceived as low	9	12	*"But the other aspects, I don't feel so competent, so I tried to limit myself* "P11
	Acquiring competence	During training and clinical experience	14	20	*"Yes, I think that came around with the experience after so many years of dealing with people with these different conditions. You end up educating either yourself or taking a course, and you improve these aspects because there are things you meet every day" P6.*
		Internet	6	6	*No, we Google soft copy most of the time we go directly online and get the Information P4* *I walk a lot with this Physio-works,Physiopedia and some online physiotherapy groups and so most information we are getting is usually from there online, P6.*
		Seminars and workshops	4	6	*"Yes, ideally, we used to organize scientific meetings with presentations, but each department presents only once a year. So, when others are presenting, you learn as well when you're presenting, they learn as well from you" P15*
		Books and publications	4	6	*"Yeah, health education, mostly materials, like studies that have been carried out and you get them from books, publications. I'm so confident that if I have to apply a material that I have seen online, and I'm convinced that it works"* P11 *"Concerning diet, I had a book here called revolution des etudes du docteursArcaves an American. I used to explain to patient how to manage their weight and at times I give them my own personal experience, because formerly I was a diabetic patient with the diet I had. Now I'm no more taking diabetic drugs"* P9.

	Delivery methods	Verbal discussion	7	9	*"I talk individually because first of all, I don't have space to keep them to talk in group", P6,15,16* *"It's just one on one. Yes, I know that group discussion exists, but in that case, many patients are not very open. The patients have to trust you, before they can open up. I don't think I see that, and I can confirm that the many of them, I can say all of them are not open" P10.*
		Group education or exercise	5	8	*"The truth is that when you do it in a group, it has more effect than when you do it individually, because in group people can share their experiences, and then it helped them to really change. When you do it individually, the person might listen. But at the end of the day, they don't have the courage to follow up the advice" P15*
		Written or print out	2	3	"*I can say that the reason why I'm doing it always verbally is because I don't have the time to just write it, and to print it on papers, to help others. We know that it's not everybody that always likes to read. I can say that my brothers and sisters copied those habits and they don't read. I'm not saying that is the reason why I'm not doing it" P12*

Appendix 3: Study 4, Published Supplementary Files

S1: SURVEY
SECTION A – PERSONAL DATA

Select or complete the following appropriately

Gender

- ○ Male (1)
- ○ Female (2)

Age in years_____
What is your occupation_____
What is your highest level of education?

- ○ a. Primary school (1)
- ○ b. High school_ (2)
- ○ c. Secondary school (3)
- ○ d. Undergraduate degree (4)
- ○ e. Postgraduate degree (5)
- ○ f. Others (please specify) (6)

SECTION B: CONCERNS TOWARDS HEALTH

i) Which of the following best describe you? (Tick all that apply)

- ☐ a. High blood pressure (1)
- ☐ b. Diabetes (2)
- ☐ c. Overweight (3)
- ☐ d. regular smoker (4)
- ☐ e. Regular alcohol consumer (5)
- ☐ f. Stroke (6)
- ☐ g. High cholesterol (7)
- ☐ h. Heart attack (8)
- ☐ i. Coronary heart disease (9)
- ☐ k. Others (Please, specify) (11)

II) Do you have difficulty with any of the following because of the condition(s) above

	No difficulty (1)	A little difficulty (2)	Moderate difficulty (3)	Extreme difficulty (4)
Taking part in exercise or physical activity (e.g. going to the gym, taking a walk) (1)	○	○	○	○
Doing usual daily activities (e.g. cleaning, cooking) (2)	○	○	○	○
Following médications (3)	○	○	○	○
Making hospital visits (4)	○	○	○	○

III) Choose your most frequent symptom(s) among the following (choose all that apply).

- ☐ a. Difficulty breathing (1)
- ☐ b. Difficulty breathing at night (2)
- ☐ c. Cough, (3)
- ☐ d. Chest pain, (4)
- ☐ e. Dizziness, (5)
- ☐ f. Palpitations (racing, punding or fluttering heartbeat), (6)
- ☐ g. Swelling of the arms or legs (7)
- ☐ h. Loss of appetite, (8)
- ☐ i. Difficulty breathing when lying down (9)
- ☐ j. Vomiting, (10)
- ☐ k. Poor sleep (11)
- ☐ l. Others (please, specify).

IV) Do you follow medicine/drug recommendations suggested by your physician or other specialist?

- a. Not at all (1)
- b. Sometimes (2)
- c. Usually (3)
- d. Always (4)

V) If not always, why do you not follow medicine/drug recommendations in the question above (tick all that apply)

- a. Expensive to afford (1)
- b. Inconvenient to keep to frequency (2)
- c. Drugs not readily available even when you have the money. (3)
- d. The side effects are too many. (4)
- e. No one to remind and administer it sometimes (5)
- f. Fade up with constant medications. (6)
- g. Other (please, specify) (7)

SECTION C. PERCEPTION ON PHYSIOTHERAPIST-LED HEALTH PROMOTION

I) How helpful would it be to discuss the following with your physiotherapist?

	Not useful (1)	probably not useful (2)	very useful (3)
Exercise or physical activity (1)	☐	☐	☐
Diet (2)	☐	☐	☐
Weight management (3)	☐	☐	☐
Sleep (4)	☐	☐	☐
Stress issues (5)	☐	☐	☐

Alcohol intake (6)	☐	☐	☐
Giving up smoking (7)	☐	☐	☐
Managing your blood pressure, diabetes, or cholesterol (8)	☐	☐	☐
Medications (9)	☐	☐	☐
Othe therapies (e.g traditional medicine) (10)	☐	☐	☐
Other (Please, complete) (11)	☐	☐	☐

II) Which of the following applies to your recent experience of physiotherapy?

	Never (1)	Sometimes (2)	Always (3)
Has your physiotherapist ever made you uncomfortable about your condition? (1)	○	○	○
Can physiotherapists form good relationships with patients? (2)	○	○	○
Do you think the role of physiotherapists is limited to exercise prescription? (3)	○	○	○
Do you think that physiotherapists lack the skills to assist you with your condition? (4)	○	○	○
Has your physiotherapist discussed treatment goals and objectives with you? (5)	○	○	○

Does the physiotherapist praise and motivate you for reaching your goals? (6)	○	○	○
Do you think the physiotherapist workload is too much to allow them talk about your health? (7)	○	○	○
Do you tend to have similar views towards your condition as your physiotherapist? (8)	○	○	○

Section D. USEFULLNESS AND ACCEPTABILITY OF HEALTH PROMOTION PRACTICE

I) Which of these areas do you find useful in improving the management of your conditions? (tick all that applies).

	Not at all useful (1)	Moderately useful (3)	Very useful (4)
Increase general physical activity (1)	○	○	○
Increase specific exercise uptake (2)	○	○	○
Advice regarding eating more vegetables (3)	○	○	○
Advice for daily water intake (4)	○	○	○
Dietary advice to decrease fatty food intake (5)	○	○	○
Dietary advice to reduce excessive salt use (6)	○	○	○
Dietary advice to increase e fruits intake. (7)	○	○	○
Discussions on weight management. (8)	○	○	○
Explain the value of Body Mass Index as a measure of health (9)	○	○	○

Encouraging you to stop smoking. (10)	○	○	○
Education around normal sleeping patterns. (11)	○	○	○
Counsel to manage stress (12)	○	○	○
Counsel on alcohol consumption (13)	○	○	○
General advice on your main condition (	○	○	○

II) How happy are you to receive the following advice from a physiotherapist?

	Acceptable (1)	Undecided (3)	Unacceptable (5)
Increase general physical activity (1)	○	○	○
Increase specific exercise uptake (2)	○	○	○
Advice regarding eating more vegetables (3)	○	○	○
Advice for daily water intake (4)	○	○	○
Dietary advice to decrease fatty food intake (5)	○	○	○
Dietary advice to reduce excessive salt use (6)	○	○	○
Dietary advice to increase e fruits intake. (7)	○	○	○
Discussions on weight management. (8)	○	○	○
Explain the value of Body Mass Index as a measure of health (9)	○	○	○
Encouraging you to stop smoking. (10)	○	○	○

Education around normal sleeping patterns. (11)	○	○	○
Counsel to manage stress (12)	○	○	○
Counsel on alcohol consumption (13)	○	○	○
General advice on your main condition (14)	○	○	○

There is also an opportunity to take part in a second phase which will involve a more in-depth discussion about your experiences with physiotherapist and the services. If you are happy to participate, kindly provide your preferred contacts below and I will contact you in the next few weeks with further information to enable you take part in the research activity.

Name and Email

_____

Phone number

_____

We thank you for your time spent taking this survey. Your response has been recorded.

Kind regards,

Etienne Ngeh

S2: TOPIC GUIDE FOR THE SECOND PHASE

1. Thank you for agreeing to be interviewed for this research. Are you comfortable for me to have a recording of this discussion?
2. How are you doing health wise now?
3. When and why did you start attending physiotherapy?
4. From your previous experiences of Physiotherapy what type of management did you receive.

Prompt:

   i. Did you receive any advice about changing any elements of your lifestyle i.e. smoking, sleeping, alcohol etc.?
   ii. Are you currently maintaining any habit or lifestyle based on the advice you received from the physiotherapist?
   iii. Explore specific components of lifestyle areas

5. In your own experience what are the greatest concerns about nature or type of physiotherapy services to enable you improve and have control over your health in this establishment?

Prompts:

   i. Availability of what you need
   ii. Cost of the service
   iii. Nature of interaction with physiotherapists
   iv. Delivery methods

6. Based on your past experiences with physiotherapists, do you find it useful in improving your health?

Prompts:

   i. Are there some areas you find physiotherapists more useful than others?
   ii. Are there some areas you think physiotherapists should improve on to better manage lifestyle related conditions?

7. In terms of qualifications and competence, what do you think of physiotherapists' ability to provide information, education, and resources to help people improve their health?
   i. Physical activity and exercise, alcohol use, weight management,
   ii. Specific conditions such hypertension and diabetes etc
8. How would you prefer physiotherapists to support you improve own condition? Considering things like exercise, diet, sleep, weight management, alcohol use etc
   i. Discussions with questions and answers
   ii. Written and printed materials
   iii. Regular meetings and education
9. Are you comfortable with physiotherapy approaches to discussing lifestyle conditions and health behavior change?

Thank you for your time and for providing responses to questions.

Supplementary file S3: Quantitative and qualitative results

1: Quantitative Results

1A: Participants perception of physiotherapist and physiotherapy services (n=146)

The majority of the respondents reported having a cordial interaction with physiotherapists (82.4%, n=120) and believe they can form good therapeutic relationships (79.5%, n=116). Physiotherapists were perceived as being competent in their role (60%, n=87). Respondents believed that the scope of physiotherapy practice is beyond exercise prescription (58.9%, n=89) and a proportion of respondents perceived that the workload of physiotherapists is always (18.6%, n=27) or sometimes (40.7%, n=59) too high to enable them to engage effectively in health education and promotional activities as reported in Table S1

Table S1: Participants experience and perceptions of PLPH (n=146)

Which of the following applies to your recent experience of physiotherapy?	Never		Sometimes		Always	
	%	n	%	n	%	n
Has your physiotherapist ever made you uncomfortable about your condition?	81.38%	118	13.79%	20	4.83%	7
Can physiotherapists form good relationships with patients?	2.05%	3	18.49%	27	79.45%	116
Do you think the role of physiotherapists is limited to exercise prescription?	58.90%	86	28.08%	41	13.01%	19
Do you think that physiotherapists lack the skills to assist you with your condition?	60.00%	87	20.00%	29	20.00%	29
Has your physiotherapist discussed treatment goals and objectives with you?	25.00%	36	27.08%	39	47.92%	69
Does the physiotherapist praise and motivate you for reaching your goals?	5.56%	8	27.78%	40	66.67%	96
Do you think the physiotherapist workload is too much to allow them talk about your health?	40.69%	59	40.69%	59	18.62%	27

1B: Perceived usefulness of PLHP interventions by pwCVDs (n=146)

Responses are summarised in Table S2; the majority of the respondents perceived PLHP interventions/advice to be very useful in improving their health and management of their conditions with mean score of 86.80% (n=124) across all components with 8.34% (n=12) considering it moderately useful and 4.79% (n=7) as not at all useful, Table S2. Higher proportions of perceived usefulness were reported for dietary advice on fruits (91.67%, n=132) and least was on advice or education to stop smoking (75. 35%, n=107).

Table S2: Perceived usefulness of elements of PLHP by pwCVDs (n=146)

Which of these areas do you find useful in improving the management of your conditions? (tick all that applies)	Not at all useful		Moderately useful		Very useful	
	%	n	%	m	%	n
Increase general physical activity	2.78%	4	9.72%	14	87.50%	126
Increase specific exercise uptake	2.07%	3	11.72%	17	86.21%	125
Advice regarding eating more vegetables	3.45%	5	7.59%	11	88.97%	129
Advice for daily water intake	3.50%	5	6.99%	10	89.51%	128
Dietary advice to decrease fatty food intake	5.59%	8	7.69%	11	86.71%	124
Dietary advice to reduce excessive salt use	1.40%	2	9.09%	13	89.51%	128
Dietary advice to increase e fruits intake.	3.47%	5	4.86%	7	91.67%	132
Discussions on weight management.	2.08%	3	11.11%	16	86.81%	125
Explain the value of Body Mass Index as a measure of health	4.23%	6	11.27%	16	84.51%	120
Encouraging you to stop smoking.	16.20%	23	8.45%	12	75.35%	107
Education around normal sleeping patterns.	3.50%	5	6.29%	9	90.21%	129
Counsel to manage stress	3.52%	5	9.86%	14	86.62%	123
Counsel on alcohol consumption	12.68%	18	7.04%	10	80.28%	114
General advice on your main condition	3.62%	5	5.07%	7	91.30%	126
Mean scores	4.79%	7	8.34%	12	86.80%	124

1C: Acceptability of PLHP interventions by respondents (n=146)

The majority of the respondents found PLHP advice/education acceptable across multiple components with a mean score of 94.65% (n=131). A small number of the respondents were undecided (3.54%, n=6) or found it unacceptable (2.34%, n=3) as reported in Figure S1. Increasing general physical activity was the highest component that pwCVDs were happy to receive advice (95.80%, n=137), and counsel on alcohol consumption was the component with the highest unacceptable respondents (4.8%, n=7).

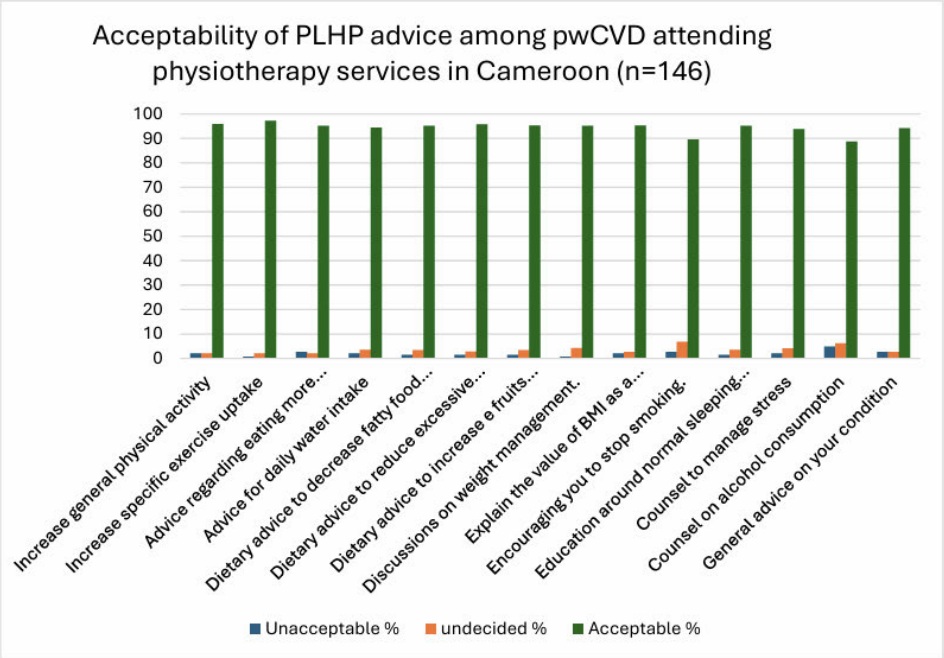


Figure S1: Components of PLHP that pwCVDs found acceptable (n=146)

2: QUALITATIVE RESULTS

	QUALITATIVE FINDINGS IN BRIEF				
Dimension	**Higher Order Theme**	**Lower Order Theme**	**Files**	**References**	
Perceptions and experiences of pwCVDs on PLHP	Sources of information	Clinical referrals	5	12	"So, he referred me to follow up with a therapist, and that's what I'm doing presently" P10.
		Media	3	7	"They told me that I could not be treated. So, I did my own research and saw that the way out was physiotherapy and weight loss" P3.
	Reasons for attending physiotherapy	Primarily cardiovascular related	7	9	"When I suddenly had a stroke in 2013" P1, "I started physiotherapy because of insomnia and being overweight" P3.
		Cardiovascular secondary	6	8	" I was a victim of an accident. I was operated upon, and I was unable to move. I was bedridden. So, after the operation, the doctor advised that I could go for physiotherapy to help speed up the recovery. So, just like a week after the operation, I started physiotherapy" P7.
	Areas of PLHP practice	Exercise and Physical activity	13	46	"I did the therapy for about 6 weeks, and then they gave me a whole lot of exercise to go back home and do" P10.
		Diet and nutrition	8	16	"Yes, they have. I was advised to consume a lot of water. I was advised to consume a lot of fruits. Yes, they have" P7
		Alcohol use	9	15	"Even after I get better, I have been told that alcohol is detrimental to my health and wanting to stay healthy for the rest of my life, I won't go back to taking alcohol. It's an impediment" P11.
		Sleep	8	11	"For sleep and so on, I would think that I still need to have some in-depth knowledge and education" P5.
		components not covered	9	16	"What they do is just the exercise, but as concerns nutrition and other health issues. I think no one has ever told me about it" P11. "Yes. First, they should educate people even though they are not dietitians, but they should educate people on their diet" P9.
		Stress and psychological	8	10	"The way my physiotherapist talked, advice and handled my case, first of all, give me a kind of full psychological treatment" P1.
		Weight	4	9	"I need to watch my weight, because when the weight increases, the pain comes back" P9.
	Relationship with Physiotherapist	Positive	8	15	"Yes, if I were to make allusion the lady I am expecting to come and handle my situation, she is wonderful and her interaction. We encourage that kind of relationship if they can work on that in their workshops and seminars, that just the word coming from a physiotherapist to a patient, can even heal that patient psychological" P12. "No, there are very interesting people, "he laughs" for my own sessions that I had were very interesting, very interesting. A lot of encouragement and you could see results" P3.
		Poor	3	6	"But others look a little bit, more of military kind of harsh to patients, some of them, but not all. Others are wonderful" P12.
	Practice of Physiot	Broaden the scope	5	9	"The physiotherapy unit is a very important unit. But again, I'll say they need to diversify their scope of training, it should be extended to other issues that affect health. P11

	herapists	of training			"So I think that physiotherapists as well, they need to be empowered in every other domain, because physiotherapy will also have to do with a change of lifestyle. It does with a change of lifestyle, so they should be empowered. They should know they should have a mastery of it, to help and educate the patients" P7.
		Professionalism	4	11	"The physiotherapist is being trained for what he does. The patient does not know what to do. So the physiotherapist should have that level of training that can take care of certain situations, because the patient is a novice, he doesn't know anything about physiotherapies. So the level of training should be improved" P11.
		Regulate training and practice	3	4	"So they really need to increase the number of people that are training in this area, because you go to some hospitals, you hardly find a physiotherapist. Then most of the time you have nursing aid assistant that have been trained informally in hospital settings, and they are handling this type of issues" P3.
	Factors affecting PLHP practice	cost	9	21	"Well for the cost. I won't say is quite affordable because someone who has to do physiotherapy, let's say for 2 months, 3 months and people go even beyond that. If you have to pay because, at the beginning, I had to come every day. So considering the standard of living here in our country, I think that the cost is not quite affordable for everyone" P7. "Subvention for citizens: The government chooses to subsidize this issue, if they want the improvement of their citizens, it's not all about money the government rules citizens. It doesn't rule people. People pay taxes because of their health care" P11.
		Poor awareness and limited sensitization	9	18	"I think the national television station has to have good slots for education of this nature and the physiotherapist. And I think that a nation that consciously and formally facilitates and assists citizens to improve their health on things that they can do without a significant cost because they're doing exercises that they learn from the physiotherapists and so on, and they have the information, we be a healthier nation and the workforce will perform better" P3. "So many people are really not educated here in Cameroon, they are really not aware or educated on the importance of a physiotherapist" P7.
		Limited training and employment in clinical practice	8	14	"Actually, I'm not aware of the capacity. I mean, how many people can be trained in this nation? Whatever the case, I think it is just a very small part. The ratio should be very low compared to the population" P1. "As I've already said, most hospital don't have that department, consequently, it's equally expensive, especially when it concerns the villagers, try to encourage even universities around to have a physiotherapy department, in their medical team. Try to encourage them" P1.
		limited home setting intervention	7	11	"That's why I would have loved for the physiotherapist to come for a home visit. To know the environment and even advise us on how to adapt to the environment. That's why I always like even home visits; I'm still striving for home visits" P5.

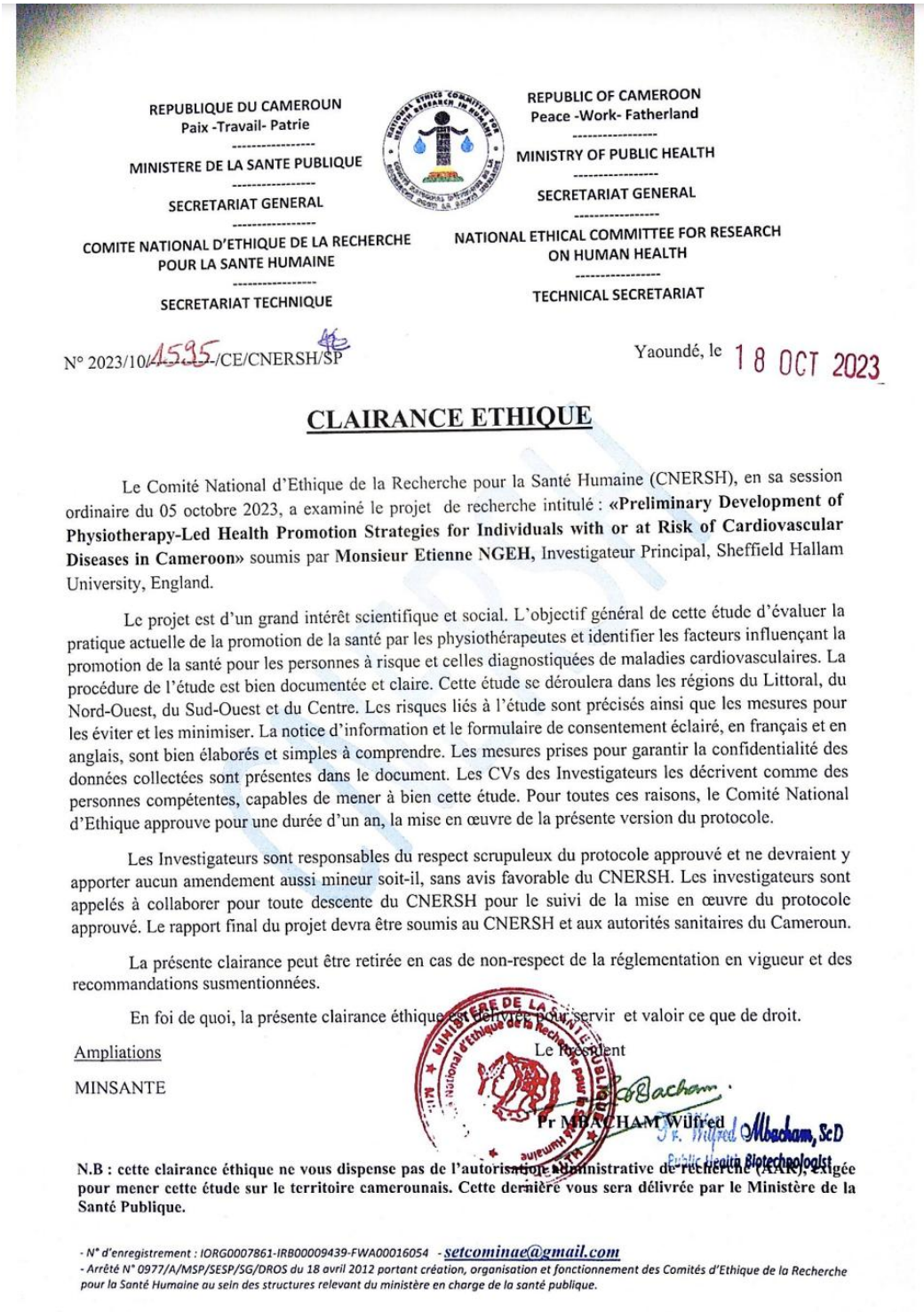
					"The government should assist, or NGOs should assist that is a physiotherapist produce a handout that can assist the patients while at home" P11.
		Limited policies related PLHP	7	8	"Still, it's not available all the times for people to be conscious about it, and it should be integrated into even our school programs, simple education, sensitization and communication to the population, part of public health, for example. Yes, let it be part of the public health program" P3.
		Lack clarity on health advice	4	7	"Yeah, because what I'm saying is that when you tell him to do some physical exercise, which by his very nature, he cannot do it, it means nothing. So it is good to tell somebody what he can do. I've had the experience where I'm told what to do, which I cannot do" P1. "But it's different from here, because I have not had that opportunity of knowing what to do out of the service here" P10.
		Accessibility	3	4	"In fact, I would say that this service is an important service. Unfortunately, this service is only available in Bamenda as of now. Go to other divisions, other subdivisions; this department is lacking. Somebody has to leave, say, Nwa, Furawa, to come for an exercise" P12.
		Motivation	3	5	"What I think they can do to improve the service of physiotherapy is to pay them reasonable salaries that will enable others and make them want to come to practice. They should be many, there are few, they are not. There are not many as they are supposed to be like other doctors. They are just few so if there are many of them, it will help to reduce or cut down waiting time. So that is it" P6. "Alone I cannot do it but when I come here, they are very specific. And I do not really like it alone because whenever I'm tired; I just get up and go. But here they say, no, 15 minutes, you still have 3 minutes and I make the effort" P13.
		Time	3	4	"They should be many, there are few, they are not. There are not many as they are supposed to be like other doctors. They are just few so if there are many of them, it will help to reduce or cut down waiting time. So that is it" P6. "So, I think that the hospital should be equipped and probably recruit more people. Because of the number of patients coming into the hospital, the waiting time is quite long. So, I think they need to improve on that as well" P7.
		Workload	6	13	"So, I just felt that they have a lot of work, because the person that comes here is working elsewhere. He has a full-time work. So when he comes here, maybe he has to rush to his office, or has other patients to see, I just feel like they are not putting enough time" P4. "I think everything boils down to time. Sometimes I feel that I don't have enough time, the workload at the level of the physiotherapist (long waiting time" P2
	Need for	specialist and	3	3	"So even though they're not dietitians, they can still play that role in talking to their patients about their diet". P9

	multidisciplinary approach to health	competence			
		Synergy	2	4	"But in the real treatment, I think that the specialists of this area are more competent if they want to take it as a disease to treat. But for the physiotherapists, I see him handling it as something resulting from his own specialty and something which his advice can equally help to check. But for treatment per say, I don't think so". P1
	Confidence in Physiotherapists	Strong confidence	8	11	"The physiotherapist wants me to be well. So, I don't think that is any advice or restrictions that they can give me, which can be contrary to essence, I don't think so. What I got, help me and for me, what they do, I don't see anything to object" P4. "My physiotherapist that is the way she talks. Her advice is very important, good that one is 100 %, she is confident doing what she's doing with me. I'm comfortable with what she's doing because I see that the practice that she gives me is workable with me" P6.
		Moderate confidence	6	10	"I cannot say that because what my physiotherapist is doing is helping me. So I cannot say that, she is trying her best". P6 "I have no idea what they can bring in, but they are the ones who should advise me". P8
	Perception of competence in PTs	Moderate	4	4	"I think that they should be empowered, it should be part and parcel of their everyday practice, I think so". P7 "I think they are competent because I have not had any mal practices from them. They are competent, customer service, I can rate it 70 on 100 customer service. So, I think they are doing a good job" P10.
		Neutral	4	10	"When you go there you see somebody, you don't know his level of education, you don't know his competence. You are left in the hands of God and him. So, it is best for the administration to know and who to put in a particular position". P11
		Poor	2	4	"Most of the time they are lacking, and they need somebody who should be overseeing them, who is actually very professional overseeing them, especially in the government settings" P3.
Usefulness and acceptability	components found to be more useful	No preference on education /advice	7	13	"What I know is that their advice, in general, is useful. Yes, I know that is useful, but to say, I can choose one for the other, no" P1. "No, no, "Nodding in disagreement" they should talk about everything. They should talk of everything that will help me. That is it" P6.
		Diet and nutrition	4	4	"Yes dieting too, because if you do a lot of physical exercise without controlling your diet, then obviously you are not doing anything good" P9.
		physical treatment	3	5	"For me, their physical treatment, so when they put their patient on the bed and they are treating, that for me is a far more important, when you are in the hands of the physiotherapists, what he does is directly impact on the treatment" P1.
	Acceptability	Importance for the public	4	8	"So I say it is extremely, very, very important. This is why I'm saying that if it were possible, you should be able to open the department in most of the hospitals around" P2. "They hold a transformational position in people's health" P9.

		Management of the condition	6	12	"When I suddenly had a stroke in 2013, it was necessary for me to get to physiotherapy for treatment. Well, I can say that was an important element in my treatment because they said it. Yes, I was heavily encouraged to do that. Let me add that it helped me a lot" P1. "It helped me, and I saw that I followed the sequence of exercises, and they help me a lot. Yes, I believe that when you do the therapy and a therapist works with you the appropriate way, it will help you to improve on your health" P10.
Delivery methods	Preferred methods of PLHP	Individual approach	7	8	"By discussion, because when you discuss with someone, you have the possibility to ask questions where you have not been very clear about what has been said. So I think for me, it's by discussion" P7. "But to in-patients, that individual approach can be okay, because if somebody is bedridden, and you have to treat the patient, you cannot take him to another place to join them, you cannot join them. So it is easy to talk to them individually" P1.
		Written or prints	6	12	"And besides that, there should be handouts. That is another level of improving, the physiotherapist prepares handouts. So, the physiotherapist should produce manuals" P11. "You know, papers printed I will take and keep at home. You see, because I have sight problems as well. If it's maybe audio I can listen, but if it's written, I will take it and I will keep it. Well, you know people take papers, but they don't read" P1.
		no preference	6	7	"Anything that is going to enlighten me about my standard of living and educate me on how I'm supposed to live. No matter the means, I think I'm okay with that. If they are apps and whatever I don't mind" P7.
		Lecture format	3	5	"When the patients, especially the able patients, when they come together say 10 to 15 and so on, it is good that they are given a general lecture on what you're saying. That is on their meal, their sleep, their physical activities and so on. They should be given a general lecture, because talking to individuals, the language change from one person to the other" P10. "So, they can always just talk to them in little groups as they come. They can sensitize them in the morning, before they start their work, it'll be important" P9.
		Regular talks or sessions	2	4	"If they have a session, once a month, for example, like my endocrinologist is in the military hospital, is a corner in the military hospital in Yaounde that's where I came from. He organizes what they say a "talk" every month with his patients and it's very helpful if there is something like this here, I will like that. I'll be coming" P13. "But if I hear that, you people have organized a seminar or a come together to lecture people, I will still come. I'll be happy" P8.
		Audiovisual/media	2	2	"They can even do health talks on programs or health talk programs on radio, on television, why not even on flyers? For those will be able to read, they can read, but I think that physical, direct physical contact, visiting people in their groups, in the churches and all that will help or go a long way to make people

					understand what the role of the physiotherapist is in their community" P9.
		Home visits	2	2	"I would love that. But because I am having challenges, I think that doing it in a group might not be very comfortable working in a group. That's why I always like home visits; I'm still striving for home visits" P5.
		Use of apps	1	2	"By discussing and sending those apps. There are very educative apps I used to receive" P4.
		Patient support group (Forum for asynchronous communication)	1	1	"If someone has about 20 sessions, and then the physiotherapist has about 20 patients that he attends to. I think, to me, my own opinion, a forum should be made so that questions and answers daily. This is what I'm not going through. This will enhance the improvement of compliance". P11

Appendix 4: Ethical Approval for Research Programme Cameroon



REPUBLIQUE DU CAMEROUN
Paix -Travail- Patrie

MINISTERE DE LA SANTE PUBLIQUE

SECRETARIAT GENERAL

COMITE NATIONAL D'ETHIQUE DE LA RECHERCHE POUR LA SANTE HUMAINE

SECRETARIAT TECHNIQUE

REPUBLIC OF CAMEROON
Peace -Work- Fatherland

MINISTRY OF PUBLIC HEALTH

SECRETARIAT GENERAL

NATIONAL ETHICAL COMMITTEE FOR RESEARCH ON HUMAN HEALTH

TECHNICAL SECRETARIAT

N° 2023/10/1595/CE/CNERSH/SP

Yaoundé, le 18 OCT 2023

CLAIRANCE ETHIQUE

Le Comité National d'Ethique de la Recherche pour la Santé Humaine (CNERSH), en sa session ordinaire du 05 octobre 2023, a examiné le projet de recherche intitulé : **«Preliminary Development of Physiotherapy-Led Health Promotion Strategies for Individuals with or at Risk of Cardiovascular Diseases in Cameroon»** soumis par **Monsieur Etienne NGEH,** Investigateur Principal, Sheffield Hallam University, England.

Le projet est d'un grand intérêt scientifique et social. L'objectif général de cette étude d'évaluer la pratique actuelle de la promotion de la santé par les physiothérapeutes et identifier les facteurs influençant la promotion de la santé pour les personnes à risque et celles diagnostiquées de maladies cardiovasculaires. La procédure de l'étude est bien documentée et claire. Cette étude se déroulera dans les régions du Littoral, du Nord-Ouest, du Sud-Ouest et du Centre. Les risques liés à l'étude sont précisés ainsi que les mesures pour les éviter et les minimiser. La notice d'information et le formulaire de consentement éclairé, en français et en anglais, sont bien élaborés et simples à comprendre. Les mesures prises pour garantir la confidentialité des données collectées sont présentes dans le document. Les CVs des Investigateurs les décrivent comme des personnes compétentes, capables de mener à bien cette étude. Pour toutes ces raisons, le Comité National d'Ethique approuve pour une durée d'un an, la mise en œuvre de la présente version du protocole.

Les Investigateurs sont responsables du respect scrupuleux du protocole approuvé et ne devraient y apporter aucun amendement aussi mineur soit-il, sans avis favorable du CNERSH. Les investigateurs sont appelés à collaborer pour toute descente du CNERSH pour le suivi de la mise en œuvre du protocole approuvé. Le rapport final du projet devra être soumis au CNERSH et aux autorités sanitaires du Cameroun.

La présente clairance peut être retirée en cas de non-respect de la réglementation en vigueur et des recommandations susmentionnées.

En foi de quoi, la présente clairance éthique est délivrée pour servir et valoir ce que de droit.

Ampliations

MINSANTE

Le Président

Pr MBACHAM Wilfred

Pr. Wilfred Mbacham, ScD
Public Health Biotechnologist

N.B : cette clairance éthique ne vous dispense pas de l'autorisation administrative de recherche (AAR), exigée pour mener cette étude sur le territoire camerounais. Cette dernière vous sera délivrée par le Ministère de la Santé Publique.

- N° d'enregistrement : IORG0007861-IRB00009439-FWA00016054 - setcominae@gmail.com
- Arrêté N° 0977/A/MSP/SESP/SG/DROS du 18 avril 2012 portant création, organisation et fonctionnement des Comités d'Ethique de la Recherche pour la Santé Humaine au sein des structures relevant du ministère en charge de la santé publique.

Appendix 5: National Authorisation for Research Programme, Cameroon

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie

MINISTERE DE LA SANTE PUBLIQUE

SECRETARIAT GENERAL

DIVISION DE LA RECHERCHE
OPERATIONNELLE EN SANTE

N°D30-1408/L/MINSANTE/SG/DROS

REPUBLIC OF CAMEROON
Peace-Work-Fatherland

MINITRY OF PUBLIC HEALTH

SECRETARIAT GENERAL

DIVISION OF HEALTH
OPERATIONS RESEARCH

Yaoundé, le 20 NOV 2023

LE MINISTRE
Au
M. Etienne NGEH
Department of Health and Wellbeing
Health Research Institute,
Shelffield Hallam University, England
Tel: [redacted]
E-mail: [redacted]

Objet: *Autorisation Administrative de Recherche*
N° 631-2723

Monsieur,

Vous avez bien voulu solliciter de mes services, en qualité d'Investigateur Principal, une Autorisation Administrative de Recherche pour mener sur une durée de 4 mois, votre travail de recherche académique menant à un doctorat en physiothérapie à l'Université Sheffield Hallam intitulé : « **Preliminary development of physiotherapy-led Health Promotion Strategies for individuals at risk or with Cardiovascular Diseases in Cameroon »;** introduite en votre nom et celui de : Sionnadh McLean , Shelffield Hallam University, England: comme co-investigateurs.

J'ai l'honneur de vous signifier la présente Autorisation Administrative de Recherche qui vous permettra de démarrer vos travaux. Vous voudrez bien noter que la Division de la Recherche Opérationnelle en Santé est chargée du suivi de la conformité aux principes de bioéthique de ce projet et devra être informée de vos activités, ainsi que des conclusions de votre étude au cours d'une restitution publique.

Le Ministère de la Santé Publique se réserve par ailleurs le droit d'effectuer des missions de suivi de la mise en œuvre de ladite recherche et d'arrêter celle-ci en cas de non-respect du protocole approuvé et pour lequel cette autorisation vous est accordée.

Toute découverte au cours de vos travaux devra être signalée à la Division susmentionnée avant publication et les deux parties à savoir, l'Investigateur Principal et le Ministère de la Santé Publique détiendront les droits de propriété intellectuelle.

Toute modification du présent protocole devra être signalée par écrit à l'Administration après une nouvelle approbation par le Comité National d'Ethique. Le numéro de votre Autorisation Administrative de Recherche sus référencée devra être cité dans vos courriers ultérieurs.

Veuillez croire, **Monsieur,** à l'assurance de ma considération distinguée.

LE MINISTRE
Pr. Manaouda Malachie

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Site Web: www.minsante.cm / www.minsante.gov.cm

Division de la Recherche Opérationnelle en Santé, tel: 22 23 45 18, Fax : 22 23 45 19, Email : minsanterecherche@yahoo.fr

Appendix 6: Support Letter from Cameroon Society of Physiotherapy

CAMEROON SOCIETY OF PHYSIOTHERAPY

CA.S.P

SOCIETE CAMEROUNAISE DE PHYSIOTHERAPIE

THE HEALING HANDS

Ref: CASP/PO/2022/AC004

Office of the President,
Cameroon Society of
Physiotherapy
Douala-Cameroon
Date: 06 MAI 2022

Letter of Support to Mr. Ngeh Etienne N. (Sheffield Hallam University)

Following your request to use our database for the purpose of research **"A survey of barriers and facilitators of physiotherapy led health promotion for people at risk or with cardiovascular disease in Cameroon"**, I the undersigned president of the Cameroon Society of Physiotherapy is willing to provide you with the following support.

- Provide you with emails and WhatsApp contacts of available physiotherapists practicing in Cameroon for the purpose of the study.
- Assist with reminders to encourage physiotherapists to complete the surveys.

Please, do reach out if you have any further queries.

Yves Thierry KAGWE

CASP PRESIDENT

Appendix 7: Ethical Approvals from Sheffield Hallam University (Converis)