

**F.I.T Wāhine – Acute Physiological and Perceptive Responses
to an Adapted High-Intensity Interval Training Protocol with
Inactive Māori Women – a Māori Values Approach.**

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Mihi

Tēnei au te hōkai nei o taku tapuwae.

Ko te hōkai nuku ko te hōkai rangi

Ko te hōkai a tō tupuna a Tānenui-a-rangi

Ka pikitia ai ki te rangi tūhāhā ki te Tihi-o-Manono

Ka rokohina atu rā ko Te Matua-kore anake

Ka tīkina mai ngā kete o te wānanga

Ko te kete-tuauri

Ko te kete-tuatea

Ko te kete-aronui

Ka tiritiria ka poupoua

Ka puta mai iho ko te ira tangata

Ki te wheiao ki te ao mārama

Tihei-mauri ora!

Ko Te Ahuahu te maunga

Ko Ngatokimatawhauroa te waka

Ko Omapere te wai

Ko Parawhenua te marae

Ko Ngati Hineira me Uritaniwha nga hapu

Ko Ngapuhi te iwi

Tena koutou, tena koutou, tena koutou katoa.

Abstract

The purpose of this study was to identify acute physiological and perceptive responses to adapted high intensity interval training with inactive Māori women, using a Māori values approach in a community setting. The approach aimed to acknowledge and apply values such as whanaungatanga, manaakitanga, and employ principles of tikanga deemed appropriate for a community-based exercise intervention. Fourteen self-reported “inactive” or low active Māori women (38.3 ± 11.6 years) were familiarized with the training protocol over a 4-week period (2-3 training sessions offered per week) and performed 20 “sets” of 30-second work followed by 30-second rest/recovery (total session time 20 minutes). Sets included bodyweight and resistance based exercise stations repeated four times over the session. Variables of interest included set and session heart rate (HR), rate of perceived exertion (RPE), affective valence on the feeling scale (FS), and change in salivary cortisol (SC) and blood lactate (BL) from pre-session to post-trial to 20 minutes post-trial. Additional perceptive responses were recorded 20 minutes post-trial to assess exercise enjoyment (PACES), self-efficacy and exercise intentions. Analyses were conducted to determine responses to the protocol. There was a significant increase pre-trial to post-trial for BL (1.2 ± 0.3 to 5.8 ± 1.1 , $p < 0.001$) and SC (2.5 ± 0.8 to 4.6 ± 3.0 , $p = 0.038$), and SC elevations remained at 20-min post-trial (6.6 ± 4.3 , $p = 0.011$). Mean %HR (age predicted percentage of heart rate maximum) was $85.2 \pm 7.2\%$. Subjects mean RPE during exercise was 7.1 ± 1.0 , while their overall session RPE was 7.9 ± 0.7 . The mean affective response (FS) to the overall session (3.5 ± 1.9) was rated as more positively than mean in-session responses (2.0 ± 1.7). A Wilcoxon Signed Rank Test revealed significantly lower self-efficacy between participants’ reported confidence in their ability to perform the exercise in the next four weeks: three times per week ($70 \pm 30.4\%$), compared to their confidence to perform the exercise once a week ($89.3 \pm 18.2\%$), $p < 0.01$, or twice a week ($87.1 \pm 20.2\%$), $p < 0.01$. The same test revealed a lower degree of intention to perform the exercise three times per week (5.1 ± 1.4) over the next four weeks compared to once a week (6.4 ± 0.9), $p < 0.01$, or twice a week (5.9 ± 1.1), $p < 0.001$. Whole-body exercise incorporated into a high intensity interval format, delivered in a real-world and culturally appropriate manner, is an effective physiological stimulus for previously inactive Māori women. Such an exercise protocol could be a viable alternative to current public health messages regarding physical activity.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

A handwritten signature in blue ink, consisting of stylized, overlapping loops and a long horizontal stroke extending to the right.

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Hine tu, hine ora.

Explanation of Māori terms

Atua	Deity
Awhinatanga	To support
Hinengaro	Mental, Psychological
Hauora	Health, Wellness
Huahuatau	Metaphor
Hui	Meeting
Kai	Food
Kapu ti	Drink, cup of tea
Kanohi-ki-te-kanohi	Face-to-face
Kaupapa Maori	Maori approach, principles, ideology
Kotahitanga	Unity, solidarity
Manaakitanga	Hospitality, process of showing respect
Matauranga	Knowledge, wisdom
Matua	Human form
Mauri	Life force
Noa	Ordinary, free from restriction
Papatuanuku	Earth Mother
Patu™	Social Enterprise Franchise Healthy Lifestyle Programme
Ranginui	Sky Father
Taha	Wall, side
Tapu	To be sacred, or potential for harm
Taumata	Level
Te Ao Māori	Maori world view
Te Ara Tika	Ethical Framework for researchers working with Maori
Te Pae Mahutonga	Health promotion framework based on the Southern Cross constellation
Te Wheke	Maori health model based on the 8 tentacles of an octopus
Tika	To be proper or appropriate
Tinana	The physical dimension or body
Tino rangatiratanga	Self-determination
Tiriti o Waitangi	The Treaty of Waitangi (New Zealand's founding document)
Toi Tangata	National Organisation specialising in Maori approach to physical activity and nutrition
Wāhine	Women
Wai	Water
Wairua[tanga]	Spirit[ual]
Whakapakari Tinana	Physical fitness, exercise
Whakapapa	Genealogy, lineage, or to layer
Whakatauki	Proverb

Whanau	[Extended] Family
[Whaka]whanaungatanga	[The process of establishing] relationship, sense of connection
Whare	House
Whare Tapa Whā	Maori health model based on the four walls of a house
Whenua	Land, ground (also refers to placenta)
Whetu	Star, celestial body

Table of Abbreviations

BL	Blood lactate
CRF	Cardiorespiratory fitness
CT	Circuit training
DMT	Dual mode theory
EE	Energy expenditure
EPOC	Excess post-exercise oxygen consumption
ES	Effect size
F.I.T.	Functional high intensity interval training
FS	Feeling Scale
HIFT	High intensity functional training
HIIRT	High-intensity interval resistance training
HIIT	High-intensity interval training
HR	Heart rate
HRQoL	Health-related quality of life
MICT	Moderate intensity continuous training
MPHS	McLaren Park Henderson South
PACES	Physical Activity Enjoyments Scale
RPE	Rate of perceived exertion
RT	Resistance training
SC	Salivary cortisol
SDT	Self-determination theory
WHO	World Health Organization

Chapter 1 : INTRODUCTION

1.1 Physical Activity and Health

The beneficial effects of adequate physical activity and a healthy diet are well recognised in relation to lifestyle disorders, but their impact on health is complex and multi-faceted (Fox, 2007; French, Story, & Jeffery, 2001; Penedo & Dahn, 2005). In particular, physical activity guidelines include the recommendation of a minimum of 30 minutes of moderate intensity activity per day for at least 5 days per week or a total of 75 minutes of vigorous intensity activity per week (Ministry of Health, 2015b). These recommendations include deliberate exercise that is planned, structured and repetitively performed (such as running or sports), whose specific benefits are known to exceed those of the minimum recommendations (Pescatello, Arena, Riebe, & Thompson, 2014). Physical activity is shown to help protect against heart disease, stroke, type 2 diabetes, certain cancers, osteoporosis and depression through improvements to a range of mechanisms, including cardiorespiratory fitness (CRF) (World Health Organization, 2010a, 2010b). Although the benefits of physical activity are also closely linked to reductions in obesity (and maintaining a healthy weight), the wider benefits of being physically active have been found to be significant independent of weight loss. Additionally, those obese or overweight individuals who have a good level of CRF can have better health and well-being than an individual with low CRF but an ideal body mass index (BMI) (R. Ross et al., 2000). Ultimately this means that it is possible to positively influence health and well-being without weight loss being the primary objective, although such findings are not universal (Fogelholm, 2010).

Unfortunately, the issue of physical inactivity is of growing concern globally and within Aotearoa New Zealand. As a leading risk factor for mortality, physical inactivity accounts for around 6% of deaths globally, surpassed only by high blood pressure, tobacco use, and high blood glucose. Mortality associated with being overweight or obese is around 5% globally (World Health Organization, 2010b). In contrast to physical activity, which is described as any bodily movement that expends energy and raises the heart rate above resting, inactivity is classified as less than 30 minutes of physical activity in a week. Different still is sedentary behaviour, which describes time spent in low-energy postures, such as sitting or lying (Ministry of Health, 2015b). Evidence suggests that sedentary behaviour has additional negative effects on health (Biddle, Pearson, Ross, & Braithwaite, 2010), which adds to the importance of public

health initiatives encouraging regular physical activity. Sedentary behaviour will not be further discussed in this review but it is an important component of national activity guidelines (Ministry of Health, 2015b).

Within Aotearoa New Zealand, physical inactivity rates appear to be increasing. The latest New Zealand Health Survey 2014/15 shows that 14% of adults are inactive (doing less than 30 minutes of physical activity in the past week), which is higher than the previous report in 2006/07 where 10% were inactive. Women were more likely to be physically inactive than men and less than half of women were found to be physically active (47%) compared to men (51%) (Ministry of Health, 2015a). The reality that over half of the population are not sufficiently physically active is not a new concern, but may be a demonstration that current strategies may be proving inadequate.

Of even greater concern are the rates of physical inactivity in Māori populations in Aotearoa New Zealand. Along with Pacific and Asian populations, Māori were 30% more likely to be physically inactive than non-Māori (and non-Pacific and non-Asian), after adjustments for age and sex differences. Māori rates of reported physical inactivity have increased according to the latest health survey, from around 9% in 2006/07 to 17% in 2014/15 (Ministry of Health, 2015a). The impact of physical inactivity on health compounds the already significant health disparities experienced by Māori (to be discussed below). This increase in physical inactivity for contemporary Māori (Ministry of Health, 2015a) is in stark contrast to pre-European or traditional Māori activity levels and the associated vitality of Māori. Early Māori were physically and spiritually connected with the environment that they lived in, harsh as it was, and this resulted in strong, fit, and consequently relatively healthy people. As a result of the physical nature of everyday life for Māori, including all manner of food collection and preparation, physical activity was based on the necessity of movement for survival or thriving, as opposed to the need to acquire health. However, as a result of the events surrounding and following European settlement and colonisation, Māori life was changed, and the consequences that followed included poorer health and well-being (Lange, 2011).

Unfortunately, the current depiction of Māori health in New Zealand is worrying (not unlike many Indigenous populations), partly owing to the changes to traditional diet, physical activity levels and other socio-cultural factors (Ajwani, Blakely, Robson, Tobias, & Bonne, 2003; Ministry of Health, 2015a, 2016b; J. Simpson, Adams, Oben,

Wicken, & Duncanson, 2015). Māori are poorly represented among health and well-being statistics specifically related to cardiometabolic disorders (Ajwani et al., 2003; M. Durie, 1994; Te Roopu Rangahau Hauora a Eru Pomare, 1995; World Health Organization, 2010b). A recent Ministry of Health report on the burden of disease noted that coronary heart disease and diabetes are two of the top five specific conditions causing the greatest health loss among Māori (Ministry of Health, 2016b). Much of this may be explained by health behaviours, such as inadequate physical activity and diet, but the impact of socioeconomic status and other sociocultural factors on health are also significant (J. Simpson et al., 2015). In 2013, Māori were reported to be less advantaged across all socioeconomic indicators. These indicators include: personal income, school completion, employment, income support, overcrowded households and access to telecommunications and/or motor vehicles. Around 23.5% of Māori were found to live in the most deprived areas (decile 10) compared with 6.8% of non-Māori, while only 3.8% of Māori were found to live in the least deprived areas (decile 1) compared to 11.6% of non-Māori (Atkinson, 2014; Ministry of Health, 2014, 2016b). Income is strongly related to health and well-being, and the link between poverty and ill-health is clear. Often, those who are financially worse-off experience poorer health and have higher rates of premature death (National Health Committee, 1998). The reasons for the poor health of Indigenous peoples, and Māori in particular, are complex and cannot be explained only through socioeconomic status or individual health behaviours. When adjusted for socioeconomic status, Māori are still found to experience significantly lower life expectancy than non-Māori – a 7.1 years difference (2012-2014), down from 8.2 years (2000-2002). Generally, even those Māori in the top bracket of socioeconomic status experience poorer health than non-Māori with lower socioeconomic status (Atkinson, 2014). Although poverty, lower levels of education, and unemployment are associated with the poorer health of Māori, the apparent ongoing effects of colonisation, loss of cultural identity and links to ancestral land have a major influence (King, Smith, & Gracey, 2009; Robson & Harris 2007).

Alongside the experiences of racism, whether internalised, interpersonal or institutionalised, the complexity of Māori health must be considered in any targeted health service. This is indeed relevant in the primary health care setting, where disparities in care continue to be experienced by Māori (R. Harris et al., 2012a, 2012b). Although Māori are shown to be economically disadvantaged and disproportionately affected by high rates of illness, they were still found to receive less care from general

practitioners (Jansen, Bacal, & Buetow, 2011; Jansen & Smith, 2006). Reasons for such disparities in care are complex but it is argued that the healthcare system reflects the values of individualism and self-advocacy (based on a western-dominant view of health) and that a lack of cultural accordance and shared understanding inhibits the potential for a therapeutic relationship, which in turn impacts the provision of care (Baxter, 2002; Jansen & Smith, 2006). Cultural conventions, such as those related to secure Māori identity are acknowledged as being associated with health but have not previously been as well understood as those psycho-socioeconomic factors. However, with the development of contemporary Māori health models and research methods that acknowledge the values that have traditionally been important to Māori, there is an opportunity to utilise traditional knowledge and values in contemporary programmes, policies and projects to improve engagement with and outcomes of health services for Māori (Ahuriri-Driscoll, 2007; M. Durie, 2012; G. H. Smith, 1997).

1.2 Exercise Physiology Approach

As a result of the importance of physical activity in relation to health and well-being, extensive research has been conducted on the role it plays in relation to the prevention and treatment of illness. By specifically exploring the physiological, epidemiological and social implications related to health, exercise physiology is a useful tool to aid the understanding of the role of exercise in overcoming lifestyle illness. By measuring the mechanisms of physical fitness, exercise physiologists can better understand the relevance of physical activity or exercise to improve metabolic health (Brooks, Fahey, & Baldwin, 2005; McArdle, Katch, & Katch, 2015). These measures can include cardiorespiratory endurance or fitness (CRF); muscular strength/muscular fitness, and/or responses to physiological mechanisms, such as heart rate, blood lactate, cortisol levels and/or blood glucose, among others.

Variables such as frequency, intensity and duration are often manipulated to elicit a desired training effect (McArdle et al., 2015). The type of exercise and intensity at which it is performed is of particular interest, as global health guidelines tend to focus on the adoption of moderate intensity physical activity or exercise. The American College of Sports Medicine suggests the public health focus towards moderate exercise was a result of the assumption that it would lead to greater uptake and adherence (Pescatello et al., 2014), based in part on research into affective responses to different intensities of exercise (P. Ekkekakis & Petruzzello, 1999). Unfortunately, the adoption of adequate regular physical activity for a large proportion of the population is still

lacking. With the often-cited reason for not exercising being “lack of time”, particular interest lies in how training variables can be manipulated in order to elicit a significant result in a time-efficient manner (Vanden Auweele, Rzewnicki, & Van Mele, 1997; Zhu, Timm, & Ainsworth, 2001). Additional factors also need highlighting, as the impact of affective responses or enjoyment of exercise is also a significant topic garnering attention (P. Ekkekakis, Parfitt, & Petruzzello, 2011; Jung, Bourne, & Little, 2014).

When it comes to an exercise modality whose training variables are manipulated optimally for a population lacking time, high-intensity interval training (HIIT) is well positioned. Recently, HIIT has become acknowledged as an effective mode of exercise for improving fitness and enhancing metabolic health, if not yet widely utilised in public health initiatives (Biddle & Batterham, 2015; Cheema, Davies, Stewart, Papalia, & Atlantis, 2015). Partly due to its potency, (Astorino et al., 2013; Burgomaster et al., 2008; Little et al., 2011), and partly due to the lower time commitment required, HIIT has been shown to be a safe, effective and enjoyable exercise option (Gayda et al., 2012; Guiraud et al., 2013; Jung et al., 2014). The cardiometabolic adaptations of HIIT are often superior to those of continuous moderate intensity exercise (Tjønnå et al., 2009; Wisløff, Ellingsen, & Kemi, 2009), but there remains some reluctance in prescribing HIIT due to the presumption that the high intensity could reduce adherence with sedentary, untrained or individuals at increased risk of chronic disease (P. Ekkekakis et al., 2011; Pescatello et al., 2014). However, the feasibility of HIIT as an alternative exercise for pre-diabetic or sedentary populations is valid, and has been shown to be a preferred mode of exercise compared to continuous moderate exercise in a recent study (Jung et al., 2014). Because of the built-in rest periods that may break the monotony or alleviate concerns of sustained intensity, HIIT may represent a feasible public health alternative for introducing vigorous activity to inactive or pre-diabetic populations.

1.3 Māori Approach

Developed, in part, as a response to the issues outlined above and the ill-fit of the traditional ‘Western’ approach to health for Māori, contemporary Māori health models depict a more holistic approach. This holistic approach recognises the link between social, psychosocial and biological health, and understands that these elements are interrelated (M. Durie, 1994, 2004b). This has similarities to the definition offered by the World Health Organization which states that health is a state of complete physical, mental and social well-being, and not merely the absence of disease (Breslow, 1972).

Additionally, Māori health models expand upon this definition with contemporary models such as Te Whare Tapa Whā (Cram, Smith, & Johnstone, 2003; M. Durie, 1994), Te Wheke (Love & Pere, 2004), and Te Pae Mahutonga (M. Durie, 2004b). These models were developed to express the wide and encompassing view of health held by Māori, and other Indigenous peoples worldwide (M. Durie, 2004b).

Translating such values into an empirical research study that resonates with Māori is feasible, contingent on the approach being underpinned by values and protocols important to Māori. Engagement with Māori, beyond extracting research data, could extend to involvement in informing the research process, dissemination and holding control over interpretation and ownership of the research and its findings (Hudson, 2010). A Māori-centred research approach involves Māori at all levels of the research, from data collection to analysis, which results in Māori knowledge (M. Durie, 2004b). At the interface of Māori (or Indigenous) research and science, the legitimacy of both is acknowledged. Research at the interface can allow Māori and Indigenous researchers to use both systems as a source of inventiveness, where opportunities exist to use principles of one to enhance the other (M. Durie, 2004a). Interface research is an attempt to use values and methods from two approaches, to provide a bridge between the benefits of each, but also to draw returns for a group of people who may live at the interface (M. Durie, 2004b).

1.4 Research Aims and Scope

This current project aims to identify the responses to an adapted HIIT protocol including bodyweight, resistance based and dynamic conditioning exercises with a group of inactive Māori women. It aims to understand whether this mode of exercise is feasible in its efficacy, affective responses and enjoyment for a previously inactive population using an approach at the interface of Māori and empirical research.

As a young Māori researcher, I understand that a key aspect of this research journey will include a personal journey of coming to a better understanding of te ao Māori, mātāuranga Māori and the processes of learning and disseminating that knowledge. Just as this research is aimed at a group of people who may inhabit an interface space, I too as the researcher am aware of my position in that same space. I am mindful of my approach and positioning as I work with and alongside these wāhine, and am aware that the process will teach me as much about myself and who I am, as it will the topic and those who are involved in the research. The principle of *tuakana* and *teina* (Walker,

2004) is evident in a reciprocal manner, as I will become a learner or receiver of knowledge from the participants, just as they will learn and receive new skills from the project.

This thesis will begin with a review of applicable literature relating to relevant physical activity and exercise interventions and their relevance to health and well-being. Additionally, a review of specific modalities including high-intensity interval training and the relevance of resistance based training integration will be employed. The review will establish the need for the current project and the methodologies employed will be outlined in detail. A robust discussion of the findings of this research will connect this research with that of previous relevant studies. The results will be presented in separate chapters, as the acute physiological responses have been presented as an article, which has been submitted to a journal (pending acceptance). The acute physiological response article will preclude the methods, results and discussion of the perceptive responses. I believe that this research will occupy a space that is not well studied, especially with an approach that values and considers the approaches of Māori and exercise physiology.

The primary purpose of the study is to identify the acute physiological and perceptive responses to “short, sharp” exercise with inactive Māori women in a community-based setting. Utilising an adapted high-intensity interval training protocol including compound resistance or bodyweight exercises in an inclusive community setting over a 4-week period, the study also aims to identify whether the structure and implementation of the workouts are enjoyable and potentially viable in improving exercise behaviours. By structuring an exercise protocol that allows for short work intervals at a “hard” intensity with equal amounts of rest, it is hoped that participants can maintain the intensity while still feeling a sense of enjoyment and a confidence in their ability to perform it.

The name, *F.I.T Wāhine* is used to avoid any negative connotations around the terms high-intensity interval training (HIIT), or variations of it, such as high-intensity interval resistance training (HIIRT: this acronym sounds like a painful experience). F.I.T can be expanded to mean *functional interval or intensity training*, but also it is an attempt to create a term for which the participants can begin to identify with. Being a F.I.T Wāhine hopes to motivate inclusion, whether participants feel conventionally fit or not.

1.5 Contribution

There is little current literature around the preferences and responses of Māori women to specific exercise protocols, besides those that align with recommendations of moderate intensity exercise (M. Williams, Rush, Crook, & Simmons, 2015). Although I do not aim to discredit the value of such recommendations, this study aims to consider the literature that suggests another approach is needed to improve engagement in physical activity and the disconnect between certain groups of people and their access to effective and culturally appropriate interventions. By specifically targeting this group of women for this study, I hope to contribute to the current public health and exercise physiology literature in a significant way for Māori women.

1.6 Deciding Research Topic

The reasoning for this research topic stems from a combined interest in and passion for exercise and health, and the desire to rekindle a sense of engagement with Māori and te ao Māori. With a background in both the exercise industry and the area of community mental health, and with Māori heritage, I saw the initial need for a more appropriate approach to public health messages about physical activity and exercise. Working with many mental health clients, using community support services who experienced poor metabolic health, I became more interested in the effect of lifestyle improvements on metabolic health. These experiences of poor metabolic health were shared and often compounded for Māori, and with a desire to understand ways in which to positively contribute to Māori health, I began my journey.

1.7 Conclusion

This chapter has provided an initial background and preliminary rationale to the proposed research. Currently, the need to identify relevant and appropriate approaches to public health is clear, and particular need surrounds engagement with Māori. Physical activity and the coinciding benefits of it are well known, but it appears more needs to be done to reach the many people who do not currently perform the required amount for health and well-being. Bearing in mind that the most common reason given for not exercising is lack of time, current strategies should consider protocols that offer a time-efficient and effective alternative.

Chapter 2 : LITERATURE REVIEW

2.1 Introduction

In the application of public health strategies aimed at improving physical activity or exercise behaviour, there is a range of factors to consider. An intervention should be scientifically significant and be proven to offer improvements to physical health and overall well-being. Additionally, the intervention should be accessible, relevant and sustainable for those populations being targeted. Current initiatives such as the Green Prescription health service and other national strategies are aimed at improving the activity levels of communities, but physical inactivity is still of concern (Ministry of Health, 2014, 2015b, 2016a). With Māori experiencing disparities in health that are only compounded by their rates of physical inactivity (Ajwani et al., 2003; Ministry of Health, 2015a), targeted physical activity initiatives for Māori should be at the forefront. Deciding how to engage Māori, what to offer, and why Māori might connect with an initiative should be a topic of much consideration by researchers and public health practitioners alike.

This review will consider the relevant research in and around current public health strategies, physiological responses to certain interventions, and approaches taken to implementing such initiatives or interventions that are relevant to Māori. There will be a discussion and critique of tools used to implement, measure and evaluate relevant exercise protocols, significant interventions/initiatives, and methodologies or ways of doing – which will also be expanded upon in the methodology section. With the acknowledgement that the most often cited excuse for not exercising is “lack of time”, the focus will be on “short, sharp” exercise or adaptations to high-intensity interval training protocols. With the acknowledgement that positive affect has been found to influence future exercise behaviour, there will be a focus on affect, enjoyment and psychological aspects of exercise. With the sincere acknowledgement of the importance of relationships, connection, and holism to Māori, there will be a focus on Māori values in a research approach. With the further acknowledgement that empirical research and Indigenous values do not always align methodologically, there will be a focus on how these two approaches can meet at an interface that recognises the values of both.

2.2 Public Health and Physical Activity Initiatives

Due to the obvious health disparities and disproportionately high rates of metabolic illness experienced, Māori are often targeted for physical activity initiatives in Aotearoa (Ministry of Health, 2014). Despite the range of compounding socioeconomic, cultural and health-related factors that influence the disparities experienced by Māori, there is much evidence showing that improving physical activity/exercise levels can provide significant improvements to metabolic health, psychological well-being, and many other holistic markers of health valued by Māori (Sofi et al., 2011; Warburton, Nicol, & Bredin, 2006); however, the barriers to participation are still evident. Overall, Māori tend to participate in fewer national physical activity initiatives or associated research, compared to New Zealand Europeans (McAuley et al., 2003; J. Ross & Hamlin, 2007).

National initiatives, like the Aotearoa New Zealand Green Prescription health service (GRx), which aims to increase physical activity and the consumption of nutritious foods in order to improve health and well-being, are no different (Baxter, 2002). The GRx is made available to those living with potentially physically limiting or health-threatening medical conditions, such as diabetes, heart disease and obesity, by means of a referral from a general practitioner or practice nurse. Māori are a group significantly affected by these conditions (Ministry of Health, 2016a). Although research on the effectiveness of the GRx programme show promising improvements to activity levels and other positive experiences (Elley, Kerse, Arroll, & Robinson, 2003; Research New Zealand, 2016; Tavae & Nosa, 2012), some of the programme practices may impinge on successful engagement with Māori, such as the limited face-to-face contact involved after the referral (M. Williams et al., 2015). A recent GRx patient survey found that only 39% of patients reported that they were still following the GRx, and Māori were more likely than non-Māori to report that they were temporarily off the GRx physical activities. The main reported reasons for not currently doing their GRx activities include health problems, lack of time, and that cost was a factor. The same survey found that Māori were more likely to be suggested to undertake walking, water/pool exercise, gym exercise (activities that require significant time commitment and/or potential membership costs) (Research New Zealand, 2016). Disregarding the reason related to health problems, it seems apparent that an intervention or programme taking into account that lack of time and cost could begin to address the issue of engagement and adherence.

The most common reason for not exercising is often cited as “lack of time” (Vanden Auweele et al., 1997); however, for Māori, little is known about the perspectives and preferences towards exercise, and further still for Māori women. With the understanding that Māori view health from a more holistic view and that there are important cultural practices that are valued by Māori, it is clear that the approach taken by researchers or public health initiatives should take these values into account (Hudson, 2010). Recent research with sedentary Māori men, looking at the *Best Exercise for Māori Men*, identified key themes associated with Māori men’s thoughts on physical activity. They included the importance of establishing a sense of camaraderie and highlighted the value of relationships, also referred to in Māori as *whakawhanaungatanga*. Other themes included: distractions and priorities; problems with contemporary gym culture; and the sense of responsibility to be a provider for their whānau (family) (Warbrick, Wilson, & Boulton, 2016). However, similar work with Māori women is not available.

Historically, designing physical activity models and effective engagement has been seen as a challenge, but with the development of contemporary Māori health and research models, such as Te Whare Tapa Whā (M. Durie, 1994) or kaupapa Māori (G. H. Smith, 1997; L. T. Smith, 1999) and associated research frameworks (Hudson, 2010), the foundation for constructing successful physical activity engagement is accessible. Nevertheless, it appears from the current low participation rates of Māori that many physical activity initiatives and/or traditional exercise programmes still lack the cultural resonance often also associated with primary health care (Jansen et al., 2011). A study in the Waikato and Ngāti Tūwharetoa regions, exploring the perceptions of Māori regarding a modified GRx programme, found some relevant key themes for Māori participation. These include the preference for *kanohi-ki-te-kanohi* (face to face interactions) and the strength of Māori community health worker credibility or network ties, which have been previously identified of paramount importance when engaging with Māori (Hudson, 2010). Earlier attempts that showed some success in encouraging Māori recruitment and adherence in physical activity initiatives included group activity programmes (Hillary Commission, 1998). Even more effective is the inclusion of programme educators or advisors who were responsive to Māori need, particularly through *kanohi ki te kanohi* (Hudson, 2010; L. T. Smith, 1999). It is accepted, if not widely practised that, at the very least, researchers, services or programmes should recognise the needs, values, *te reo* (language) and customs of Māori (Bishop, 1998;

Hudson, 2010; G. H. Smith, 1997; L. T. Smith, 1999). Such considerations could help participants feel comfortable with those they are in contact with, and applying these principles demonstrates an acknowledgement of the principles of Te Tiriti o Waitangi (M. Durie & Kingi, 1998; Kingi, 2007).

Physical activity or exercise programmes need to make sense to Māori (M. Durie, 2004b), so beyond the provision of health information and specific activity structure and implementation, a programme approach should include the acknowledgement and application of values and principles important to Māori. Whether or not an identified model or framework is utilised to guide initiatives, there remains the importance of incorporating and prioritising the common themes of *whanaungatanga* (relationships, roles and responsibilities), *tino rangatiratanga* (self-determination), *matauranga* Māori (Māori knowledge, resources and processes) and *tikanga* (protocols) (M. Durie, 1994, 2004b; Hudson, 2010; L. T. Smith, 1999).

2.3 Māori Approach

While it is acknowledged that Māori are not a homogenous group but a diverse people with no single identity, *Te Whare Tapa Whā* is one model of health that is said to be adaptable to all levels of identity (A. Durie, 2001). This model is a popular contemporary framework that compares health to the four *taha* (walls) of a *whare* (house). The strength and symmetry illustrated by the four walls can be applied to health issues via its holistic lens. The application to health policy and programmes is seen to provide a starting point for culturally appropriate services for Māori. According to Te Whare Tapa Whā, ultimate health is represented by a balance between the physical, psychological, spiritual and collective (*whānau*) health, as each is intertwined and interdependent of the other (M. Durie, 1994). Consequently, if one *taha* is out of balance or deficient, it is believed that it will negatively impact on a person's overall health (M. Durie & Kingi, 1998).

Te taha tinana, the physical realm, is likely the most familiar component within the health sector; however, it is important that physical health is not viewed independently of other dimensions of health. For Māori, physical well-being is intrinsically connected with spirituality, emotional health and the relationships and well-being of *whānau* (family) (M. Durie, 1994). Such links are apparent in the concept of *tapu* (sacred or cautionary) body parts or objects associated with those body parts. These concepts are an important consideration for health practitioners in understanding illness for some

Māori and in the provision of culturally appropriate services. Not only can *te taha tinana* represent the physical body, but also it can relate to the physical environment. Alongside the connection which Māori have with *whetu* (sky), *whenua* (land) and *wai* (waterways), and their relationship to health and well-being, physical health can also be impacted by physical environments, which are themselves affected by socioeconomic factors. Such factors include: employment, housing and income and are an important consideration for health promotion providers utilising a holistic approach (J. Simpson et al., 2015). Such imbalances in this dimension can be seen as a reflection of the range of effects of colonisation and subsequent urbanisation, disconnecting Māori from traditional physical environments (Bishop, 1998; M. Durie, 2004b).

In addition to the importance of physical, psychosocial and spiritual health, this model illustrates how Māori consider health from a collective perspective. The recognition that the health of an individual within a *whānau* can affect the health of the overall *whānau* is vital. This collective perspective contrasts that of Western health and science, which generally takes an individualistic approach. The contrast between the holistic Māori view and Western science's focus on the individual may contribute to barriers that hinder Māori involvement in health research and positive outcomes that benefit Māori health (M. Durie, 1994). Durie suggests that the traditional collective lifestyle of Māori nurtured an effective organisation of society, such that the health system based on values was closely and intimately related to people and their interaction with the natural environment (1994). The consequence of this lifestyle was the manifestation of what was reported to be a relatively healthy and physically vital people (Lange, 2011). With the understanding that the circumstances and environment in which contemporary Māori now live have changed, there lies an important undertaking to identify contemporary ways of engaging in healthy activity while acknowledging traditional ways of understanding the world.

Furthermore, *wairuatanga* (spiritual wellness) and general wellness for Māori extends to knowledge of culture, identity, heritage, and our place in the world. *Tika* (customs) and *whakapapa* (genealogy and history) are integral parts of this process and sit firmly within *taha wairua* (A. Durie, 2001). The concept of *whakapapa* can describe the quality of extended familial relationships but also links *whānau*, *hapu* and *iwi* to the Māori understanding of creation (Tikao & Beattie, 1939). Acknowledging the oldest genealogical connections to the environment from the founding parents, the emphasis is based on a relationship of reciprocity and balance (Marsden, 1989; Marsden & Royal,

2003). *Ranginui* (sky-father) and *Papatuanuku* (earth mother), and their various offspring, are believed to hold responsibility over different aspects of the natural environment. That relationship of whakapapa is a reflection that physical entities also possess a *mauri* (life-force) revealing an important spiritual aspect. Health, from this perspective, is based on aspects from the individual, collective and the environment; and *mauri* is the unifying-principle. Therefore, any problems in the physical world could be viewed as a reflection of disturbances to the spiritual dimension (Marsden, 1989). Considering this principle in contrast to a deficit approach, the implication is that a thriving environment could also be reflected in spiritual, physical or overall health.

Another model developed by Ihirangi Heke, called The Atua Matua Māori framework (Deity to Human Expression) (2014), emphasises the importance of prioritising traditional environmental knowledge before the individual or human structure, and is based on a framework of whakapapa. Whakapapa, in this sense, relates to the relationships or links between certain environments. These relationships can present metaphorical learnings, which in turn can be translated into physical activities that may have specific regional interpretations. Consequently, the premise is that the incidental outcomes of health and physical activity occur through connections to *matauranga* Māori or a knowledge base that underlies behaviour. The development of this framework was an attempt to offer a Māori ancestral framework with environmentally-based concepts that would progress Māori from “the current deficit mainstream model of health” (p.2) to recognise the historical connection to the environment that has been shown to sustain Māori for centuries, pre-colonisation. Practitioners can access *matauranga* (Māori knowledge) to *whakapapa* (lineage) to *huahuatau* (metaphorical examples) to *whakapari tinana* (physical activity) at each *taumata* (level) within the framework to create or employ practical environmental expressions of connecting *atua* (deity) to *matua* (human form) (Heke, 2014).

Resulting from concerns about some of the detrimental impacts endured by Māori as a result of non-Māori researchers, kaupapa Māori (KM) research draws upon both traditional and contemporary thinking, *matauranga* and *tikanga* Māori, and the principles of post-positivist theory. Although KM is essentially instilled with a strong anti-positivistic stance, the broader vision of advancing and developing Māori provides the foundation and rationale for empirical/scientific research to merge and complement each other. In order to address issues relevant to Māori priorities with a positivistic

piece of research, if the inception of collective kaupapa and consideration of appropriate methods are followed, KM could interface with empirical research (L. T. Smith, 1999).

Traditional, Western research models have not always benefitted Māori (Bishop, 1998; Hudson, 2010; L. T. Smith, 1999). Often the information was collected by researchers whose primarily colonial views would inaccurately report the complexity of Māori values, belief systems and customs (Bishop, 1998; Bishop & Glynn, 1999). Key to the KM approach is the importance placed on Māori cultural identity, the recognition of *hauora* (optimum health and well-being) and the constructs involved (Hudson, 2010). These include the values and beliefs associated with *whakapapa*, *whanaungatanga*, *awhinatanga* (support) and *wairuatanga* practices (M. Durie, 1994, 2004b; Hudson, 2010).

The acknowledgement and the application of the principles of Te Tiriti o Waitangi is also an essential consideration for researchers seeking to understand issues in the context of the Māori world view (*Te Ao Māori*). These principles include: partnership, protection, and participation. The principles (and those outlined in *Te Ara Tika*) provide a framework for identifying ethical and practical issues for Māori in terms of the rights, roles and responsibilities for researchers and Māori communities within the research process (Hudson, 2010).

2.4 Interface

It is of growing interest, that at the interface of Western scientific approach and the holistic Indigenous approach, there can exist an approach that can feasibly bridge the two and utilise the values of both. The ability to translate values and protocols of both approaches is believed to provide an ability to use both systems as a source of inventiveness, where there is an opportunity for insights and methods of each to enhance the other. At the interface, the appreciation of synthesis occurs. Where the Western scientific method is known for reductionism of components in its analysis, Indigenous knowledge emphasises the interaction of multiple threads of the whole (holism). The synthesis of such components and their place within a system is where research at the interface thrives. Such an approach not only acts as a bridge between two seemingly polar approaches but also offers opportunities for a group of people who may find themselves living in an interface space (M. Durie, 2004a).

There has been the suggestion that there is an opportunity to realise an interface between the empirical and Indigenous approaches using exercise physiology (Warbrick, Boulton, Stannard, & Cunningham, 2014). Such an approach is based on understanding the changes to certain structures and functions of the human body using chronic or acute bouts of exercise (McArdle et al., 2015), while acknowledging the relationship and connectedness beyond those anatomical structures (Warbrick et al., 2014). Exercise physiology and its proposed tendency towards a systems approach means the potential for it to fit within an interface space is viable. An example of exercise physiology's occupation of the systems approach or interface space lies in an interpretation of its commitment to understanding key biological responses and interactions at multiple levels (Joyner & Saltin, 2008), like the combined analysis of heart rate, blood lactate, and salivary cortisol responses in the determination of exercise intensity. It is also important for research and the methods employed to make sense to Māori (M. Durie, 1994), so retaining a systems approach to understanding a whole body response, and in this study's case, a physiological and perceptive response, means it may be more appealing than other forms of scientific research.

It could be argued that the exercise physiology approach has an imbalanced bias towards the physical dimension, and may be less relevant to the other dimensions demonstrated by Te Whare Tapa Whā (M. Durie, 1994). However, there is significant literature pertaining to the influence of exercise in improving the many other facets of hauora (Fox, 2007; Penedo & Dahn, 2005). Vigorous exercise has been linked to better quality of sleep, fewer reported mental health problems after high stress exposure, and less perceived stress in college students (Gerber et al., 2014; VanKim & Nelson, 2013). Another study found improved mental and spiritual health in women participating in a church-based physical activity intervention, when compared to a non-exercising group (Jorna, Ball, & Salmon, 2006). Some of the benefits of such interventions are thought to be attributed to the added social factor when undergoing a physical activity intervention (VanKim & Nelson, 2013), but this only contributes to the idea of a systems-friendly approach associated with exercise interventions. Furthermore, Māori have long known the relationship between physical activity and well-being, with a well-known *whakatauki* (proverb) describing the benefits of activity concisely: “*Tama tu, tama ora. Tama noho, tama mate*”. The simple translation explains how activity leads to well-being or life, while laziness or lack of movement can lead to illness or death. This *whakatauki* has been adopted by a national organisation specialising in Māori

approaches to physical activity and nutrition (*Toi Tangata*), and is interpreted as encouraging movement “through physical wellbeing we thrive” (Toi Tangata, 2013).

Yet another whakatauki can be aligned with the opportunities at the interface of Māori or Indigenous knowledge, and the empirical or exercise physiology approach. “*Titiro whakamuri hei ārahi i ngā uaratanga kei te kimihia*” can be interpreted to fit the interface paradigm. It suggests that in the search for new ways or answers, one must first look to the past and what has been done before, and then seek out what to do next. In the interface space, it is understood that traditional knowledge can guide and inform the approach while exercise physiology, in this case, will provide some of the methods we utilise (M. Durie, 2004a).

2.5 Short, Sharp Exercise

2.5.1 HIIT

When it comes to a potentially viable alternative exercise structure applicable to public health, high intensity interval training (HIIT) is acknowledged as an effective modality for improving fitness and enhancing metabolic health (Biddle & Batterham, 2015; Cheema et al., 2015). Partly due to its potency, relative to total volume of exercise when compared with steady-state exercise (Astorino et al., 2013; Burgomaster et al., 2008; Gibala, Little, MacDonald, & Hawley, 2012), and partly due to the lower time commitment required; HIIT has been shown to be a safe, effective, and enjoyable exercise option (Gayda et al., 2012; Guiraud et al., 2013; Jung et al., 2014). The cardiometabolic adaptations of HIIT are often superior to those of continuous moderate intensity exercise (Tjønnå et al., 2009; Wisløff et al., 2007) but there remains some reluctance in prescribing HIIT due to the presumption of HIIT being too intense and resulting in potentially adverse responses reducing adherence with sedentary, untrained or individuals at increased risk of chronic disease (P. Ekkekakis, 2009; P. Ekkekakis et al., 2011; Pescatello et al., 2014).

The feasibility of HIIT as an alternative exercise for pre-diabetic or sedentary populations is valid, and has been shown in a recent study of 44 inactive adults, where most preferred HIIT (62%) to continuous moderate intensity training (20%) or high intensity continuous training (3%) (Jung et al., 2014). A subsequent study found that adherence to HIIT in free-living conditions, after a brief supervised laboratory intervention, was better than standard care exercise involving continuous moderate intensity training (Jung, Bourne, Beauchamp, Robinson, & Little, 2015). Because of

the built-in rest periods that may break the monotony or alleviate concerns of sustained intensity, HIIT may represent a feasible public health alternative for introducing vigorous activity to inactive or pre-diabetic populations.

While some might suggest that the nature of HIIT requires an intensity that may appear a barrier to overweight or inactive populations (Biddle & Batterham, 2015; Pescatello et al., 2014), others have shown it to be a tolerable, safe, and enjoyable means of exercise (Gayda et al., 2012; Guiraud et al., 2013; Jung et al., 2014). Rognmo et al., for example, retrospectively examined the risk of cardiovascular events during organised high-intensity interval exercise training and moderate-intensity training amongst almost 5000 patients with coronary heart disease in Norwegian cardiac rehabilitation centres (2004). Their findings illustrated the low cardiac risk associated with HIIT training (as well as moderate intensity training). The authors suggested that consideration should be made for the use of HIIT with patients with coronary heart disease due to the significant adaptations to cardiovascular function associated with HIIT, such as increased VO_2max and improved blood pressure (Trilk, Singhal, Bigelman, & Cureton, 2011; L. J. Whyte, Ferguson, Wilson, Scott, & Gill, 2013). Further reviews of patients with lifestyle-induced cardiometabolic disease in 10 studies (273 patients) by Weston, Wisløff and Coombes (2013) also found more significant adaptations with HIIT than moderate intensity exercise in relation to increased VO_2 peak; they also found decreased blood pressure, and a range of metabolic, alongside enjoyment of exercise and quality of life.

The factors associated with training-induced improvements of HIIT are complex, with both the numerous physiological (cardiovascular, metabolic, respiratory) and psychological attributes (motivation, perceived exertion, mood) contributing to outcomes. HIIT regimens can vary but often consist of repeated bouts of exercise at near maximal intensities, often between 80-95%HR max, interspersed with rest or recovery intervals. Some research has shown that as little as 2 (L. J. Whyte, Gill, & Cathcart, 2010) or 4 (Trilk et al., 2011) weeks of Wingate-based HIIT can elicit an increase in maximal oxygen uptake (VO_2max) in overweight men and women, or increase resting metabolism in healthy adults (Schubert, Clarke, Seay, & Spain, 2017). The Wingate HIIT protocol consists of 4 to 6 rounds of 30 seconds maximal effort usually with 4 minutes recovery, but can be extremely strenuous and uncomfortable, especially for untrained or sedentary populations. Although these, and other data, suggest that Wingate-style HIIT can be effective for overweight/obese individuals, the protocol requires specialised equipment, a high level of motivation from participants

and it could also be difficult to implement in real-life settings (Gibala, 2007; Gibala, Little, & Macdonald, 2012; Gibala & McGee, 2008).

In response to the concerns regarding the potential difficulties of the Wingate protocol, the use of an adapted HIIT protocol (10x 60 seconds at ~90% of maximal heart rate [HR_{max}] interspersed with 60 seconds recovery) was used. Some evidence suggests the increase in oxidative capacity and increased insulin sensitivity in overweight sedentary individuals with this protocol (Hood, Little, Tarnopolsky, Myslik, & Gibala, 2011). Further studies have shown improvements to exercise capacity with as few as 6 sessions over 2 weeks (Burgomaster, Hughes, Heigenhauser, Bradwell, & Gibala, 2005), and better early improvement to VO₂ peak when compared to moderate intensity training over a 5-week period (Astorino et al., 2013). Much of the research on HIIT is focused on more “traditional” protocols using a stationary cycle or rowing ergometers, or sprint intervals in a laboratory setting. However, these laboratory protocols and apparatuses can lack the flexibility or mobility required for group settings or public health application in community spaces.

Further variations to traditional HIIT protocols exist, where the use of resistance training (RT), bodyweight training, and/or conditioning exercises, such as boxing or battle ropes has had varied results. Alongside the potential benefit of providing the neuromuscular adaptations associated with resistance training, this type of modality could offer further advantages associated with enjoyment, adherence and/or perceived variety (Buckley et al., 2015; Davies, Coleman, & Babkes Stellino, 2016; Fountaine & Schmidt, 2015; Heinrich, Patel, O’Neal, & Heinrich, 2014). In a study comparing a HIIT protocol using boxing training (2 minutes of “hard” to “very hard” exercise with 1 minute of rest and recovery, 3 rounds of 5 stations, 50 mins total exercise) to the equivalent time brisk walking found significant reductions to blood pressure, body fat percentage, and improvements to health-related quality of life (HRQoL) (Cheema et al., 2015). Another study utilising battling ropes alongside a range of resistance based exercises, found battling ropes to produce the largest acute metabolic response out of all other exercises tested – while still producing significant responses from those large muscle compound movements such as squats and deadlifts (N. A. Ratamess et al., 2015). Similarly, acute measures of the metabolic cost of battling ropes has found the modality (with intervals of 15s work with 45s recovery, totalling 10 mins) to elicit heart rate responses between 86-95% of age predicted HR max and a peak lactate response of 11.9 mmol (± 1.4) (Fountaine & Schmidt, 2015). These studies were, however,

conducted with healthy and active subjects so the response and ability for inactive populations to perform such vigorous exercise remains unclear.

Despite the evidence supporting the metabolic adaptations from HIIT, there is less evidence regarding its muscular or strength benefits. The benefits of strength or resistance training are well known to elicit muscular hypertrophy (Nybo et al., 2010) and is also shown to be an important determinant of functional capacity (Verdijk et al., 2009). Traditional HIIT does not typically induce a significant impact on muscle mass; however, some studies have included the addition of strength training exercises to HIIT programs, in order to optimise muscle function (Astorino et al., 2013; Nybo et al., 2010). Also referred to as Multimodal (MM) training or circuit training (CT), this modality of training aims to reduce the time required of traditional strength training by incorporating resistance, body-weight, and/or other conditioning modalities in either a continuous circuit (Buckley et al., 2015) or an interval format (Buckley et al., 2015; McRae, 2012).

A low volume, Tabata protocol (8 rounds of 20s of work with 10s rest/recovery) has been used with a group of participants who completed a different single bodyweight exercise each session over 4 sessions a week. This format was able to show similar improvements to aerobic fitness (VO_2 peak) as 30 min of continuous high intensity running, and additional benefits to upper-body, lower-body and core muscular endurance (McRae, 2012). The efficacy of this particular modality for muscular strength adaptations may be limited due to the very low volume and single exercise session format. Further benefits associated with resistance training could be accommodated by utilising whole body or large muscle group exercises throughout the circuit or interval training protocol. Based on findings from Buckley et al., who compared a multimodal HIIT program (MM-HIIT) with a more traditional HIIT program using rowing (Row-HIIT), showed MM-HIIT to be a time efficient training method to achieve both metabolic and muscular adaptations. Participants in the MM-HIIT group significantly increased strength in the squat, press and deadlift ($p < 0.01$) while Row-HIIT did not (2015).

Resistance training (RT) is also well established as a fundamental component for ongoing health and well-being, and alongside the benefits for muscular and bone health/function, RT is now also linked to a variety of improvements in metabolic health markers (Artero et al., 2012; Dâmaso et al., 2014; Pescatello et al., 2014). The

inclusion of resistance training can, however, be hampered by the difficulty faced by many who lack sufficient knowledge and/or time to include it in their lives. Time commitment can influence the use of traditional resistance training, such as hypertrophy (muscle building) programming or strength training, where either a high volume of work is required or long rest periods are programmed (McArdle et al., 2015). Such limitations are potentially part of the attraction and popularity of high intensity circuit training such as CrossFit™ or less intense traditional circuit resistance training where there is usually a shorter time commitment required. The popularity of CrossFit™ may also be explained by its intensity, group dynamic, and/or its competitive nature (Davies et al., 2016; D. Simpson, Prewitt-White, Feito, Giusti, & Shuda, 2017). However, the premise by which workouts or WODs are designed (usually to complete as fast as possible) may present a barrier to those untrained, inactive or overweight, obese populations.

Different adaptations have been found with the use of differing work to rest ratios, with suggestions that greater work to rest ratio (90s:30s or 40s:20s) achieve greater mean and peak VO_2 than lower work to rest ratio (30s:30s or 60s:30s) (Gosselin, Kozlowski, DeVinney-Boymel, & Hambridge, 2012; Nicolò et al., 2014). However, the 30:30s protocol has also been found to allow moderately high metabolic values for a considerably longer overall period of time, as opposed to longer work intervals that lead to maximal values within a few minutes (Nicolò et al., 2014). The use of shorter work intervals is potentially valuable for maximising the time at or near VO_2 max (Midgley, McNaughton, & Carroll, 2007; Wakefield & Glaister, 2009), as it is believed this training stimulus is significant for neuromuscular system adaptation (Nicolò et al., 2014; Thevenet, Tardieu-Berger, Berthoin, & Prioux, 2007). Lower work to rest ratios are also thought to be a better starting point for sedentary or middle-aged populations, which allows improvement to aerobic capacity and exercise tolerance to occur before potentially progressing to a higher work to rest ratio and allowing for fewer intervals and a shorter total workout time (Gosselin et al., 2012).

Alternatively, the proposed functional high intensity interval training protocol (F.I.T) of this study, aims to structure resistance and bodyweight based exercises in a format that could potentially elicit the desired neuromuscular adaptations, improve cardiovascular conditioning, and allow for intermittent bouts of rest, as described in similar studies with positive effects on metabolic outcomes (Gosselin et al., 2012; Nicolò et al., 2014; Tanner, Nielsen, & Allgrove, 2014). Although the physiological responses and

affective response to this exact approach are not clear, the structure could potentially deliver a more palatable and enjoyable group exercise option in a sedentary population. Similar protocols, with shorter work-rest intervals, have been perceived as requiring less effort even when compared to workouts with equal overall workloads (Kilpatrick, Greeley, & Collins, 2015); and such perceptions are suggested to influence future exercise behaviour (P. Ekkekakis, 2009; D. M. Williams et al., 2008; D. M. Williams, Dunsiger, Jennings, & Marcus, 2012).

2.6 Enjoyment and Adherence

The limited effectiveness of many public health initiatives or physical activity interventions is a growing issue due to the high rates of physical inactivity, both internationally (World Health Organization, 2008, 2010b) and within Aotearoa (Ministry of Health, 2014, 2015a; Research New Zealand, 2016). Besides presenting effective modes of exercise or innovative physical activity initiatives, there is growing concern regarding the approach to understanding exercise behaviour beyond physical responses. Popular models used in public health initiatives are based on explaining behaviour based on a range of cognitive factors, such as behavioural decision making, weighing pros and cons, and making predictions about consequences. This has led to the development of physical activity interventions focusing on informing communities of the benefits of exercise or harm associated with physical inactivity. Unfortunately, evidence has indicated that education-based interventions are minimally effective (Dishman & Buckworth, 1996) and exercise behaviours appear to be driven by a unique underlying mechanism not common to other health behaviours (Newsom, 2005).

An alternative priority is to include the consideration of exercise enjoyment and how pleasant or unpleasant experiences are associated with future exercise intentions and adherence. The psychological dimension of exercise behaviour has been less acknowledged but an area of growing interest for exercise prescription and/or health promotion, especially with some research indicating that the affect experienced during an exercise session can predict future exercise behaviour (Dishman & Buckworth, 1996; P. Ekkekakis, Hall, & Petruzzello, 2008; P. Ekkekakis et al., 2011; P. Ekkekakis & Petruzzello, 1999; D. M. Williams et al., 2008). One study in particular recorded ratings of pleasure during exercise with sedentary adults and noted that a 1-unit increase (on the 11-point rating scale of pleasure) was associated with an additional 38 minutes of physical activity undertaken per week (D. M. Williams et al., 2008). There has been a tendency for public health and physical activity initiatives to advocate for the use of

moderate intensity or longer steady state exercise, over high intensity sessions, based on the premise of a proposed negative relationship between affect and exercise at a certain intensity at or around ventilatory threshold. Although the negative relationship has been shown in several studies (Panteleimon Ekkekakis, Hall, & Petruzzello, 2004; P. Ekkekakis & Petruzzello, 1999; Hall, Ekkekakis, & Petruzzello, 2002), the influence of intermittent exercise at high intensities has only recently garnered more attention. Furthermore, little is known of the relationship between affect and different exercise modalities, besides continuous aerobic exercise.

Indeed, affect and thus future exercise intentions and adherence can be influenced by a range of factors, and of particular interest is the mentioned reported negative relationship between exercise intensity and affect. Based on the presumption that affect during exercise is influenced by a range of biologically significant metabolic landmarks, dual mode theory (DMT) authors have described these specific physiological processes as “adaptive responses that signal survival-critical metabolic changes in the body” (Hall et al., 2002, p. 52). It suggests that the displeasure aroused during exercise is due to such influences as hyperventilation and increased blood lactate, meaning activity that exceeds certain metabolic landmarks may reduce engagement in similar activity in the future (Panteleimon Ekkekakis et al., 2004; P. Ekkekakis & Petruzzello, 1999). Specifically, results from other studies found evidence of a dose-response pattern relating to exercise below, at, or beyond certain physiological markers (for example ventilatory threshold [VT], or lactate threshold [LT]) (P. Ekkekakis et al., 2008; P. Ekkekakis & Petruzzello, 1999). In short, exercise intensity below such thresholds do not typically have negative affective responses, whereas exercise whose intensity exceeds certain physiological landmarks usually result in a decline in positive affect.

The relationship proposed by DMT has been substantiated in several other studies (Decker & Ekkekakis, 2017; Panteleimon Ekkekakis et al., 2004; P. Ekkekakis & Petruzzello, 1999; Hall et al., 2002; Parfitt, Rose, & Burgess, 2006). The relationship is seen as a potential barrier to sustaining sufficient and effective exercise behaviour but there is some question about its application to different exercise modes. The ACSM reports that there is lower adherence to programs involving high intensity exercise (Pescatello et al., 2014), but the weight of this link is questioned in recent reviews (Rhodes, Warburton, & Murray, 2009), and other studies involving high intensity interval training (Jung et al., 2015; Jung et al., 2014; Kilpatrick et al., 2015; Martinez, Kilpatrick, Salomon, Jung, & Little, 2015). Such findings indicate preferences or

intentions to engage in HIIT from a range of populations, despite high intensities of exercise.

Based upon Hedonic theory, which suggests that people are likely to do what brings them pleasure, exercise intentions and adherence could be predicted by the affective response to that exercise (Cabanac, 1971; P. Ekkekakis, 2009). Plainly, people will adhere to activities that they find pleasing (D. M. Williams et al., 2008; D. M. Williams et al., 2012). Besides the impact of exercise intensity, there may exist further factors that influence enjoyment and consequent future exercise intentions and adherence. Some studies have reported lower affective response to HIIT than moderate intensity continuous training (MICT), but similar levels of self-efficacy to perform the exercises, greater preference for HIIT (Jung et al., 2014) and higher levels of enjoyment (Thum, Parsons, Whittle, & Astorino, 2017). Implications are that the intermittent nature of HIIT may provide a series of respites from negative affective responses, or that recovery periods may allow participants to rebound and feel more pleasure. Additionally, the shorter periods of work, compared to continuous exercise, could boost confidence to push through more vigorous intervals of exercise, with the knowledge that it would result in an approaching period of rest or recovery (Jung et al., 2014).

Further to the idea of other influences on exercise adherence, self-determination theory (SDT) would suggest that engagement with activities is influenced by basic psychological needs (autonomy, competence, and relatedness) (Ryan & Deci, 2006). Motivation to engage in exercise is shown to be enhanced when exercise interventions are designed to meet these psychological needs (Deci & Ryan, 2000; Kirkland, Karlin, Stellino, & Pulos, 2011). One of the ways that exercise interventions have incorporated the theoretical justifications of SDT has been with the use of group-based exercise (Baumeister & Leary, 1995; Beauchamp, Carron, McCutcheon, & Harper, 2007; Belza et al., 2006). One of the main facets of SDT considers the need to feel connected to others, or relatedness, and has been found to influence motivation and intentions to engage in future behaviour (Ryan & Deci, 2006). The sense of social support is also known to contribute to community-based group interventions (Belza et al., 2006; Hunt et al., 2014), and is regarded in the Māori context as *whanaungatanga*. The value of *whanaungatanga* (or the sense of relationships or relatedness with others) was found to be a common motivator with participants in an evaluation of a nine-week fat-loss challenge run by the social enterprise *Patu*TM (Forrest et al., 2016). Several other studies have demonstrated strong evidence for group exercise in relation to these basic

psychological needs (Baumeister & Leary, 1995; Deci & Ryan, 2000; Edmunds, Ntoumanis, & Duda, 2006).

Few studies have examined acute responses to HIIT or circuit interval training in a community-based group setting, and most real-world or field-based research involves athletes, sport's teams or trained individuals (Buchheit & Laursen, 2013; Davies et al., 2016). Although group exercise and community based exercise interventions have long been utilised to encourage participation in physical activity and exercise, the impact of the group or community-based dynamic on affective responses in an adapted HIIT protocol is less clear, besides similar Crossfit™ studies (Davies et al., 2016; D. Simpson et al., 2017). With strong evidence demonstrating that group exercise interventions can enhance the main facets of SDT, which themselves have been shown to enhance exercise adherence, it could be valuable to incorporate such a structure in an exercise modality that could provide even further positive affective responses.

It is apparent that public health or health promotion strategies could benefit from activities that consider the context, culture and preferences of the targeted population. As previously mentioned, the significance of cultural resonance is also relevant when considering an Indigenous population whose view of health and coinciding health promoting initiatives requires a more holistic approach (Cram et al., 2003; M. Durie, 2004b; Hudson, 2010). Innovative exercise interventions that consider the widely reported issue of lacking time to exercise (Vanden Auweele et al., 1997), alongside the importance of the range of psychological responses to certain exercise (Edmunds et al., 2006; P. Ekkekakis et al., 2011), while acknowledging the importance of culture could contribute to the improvement of current physical activity levels, especially in populations most at risk.

2.7 Conclusion

This chapter has reviewed and synthesised current and relevant research, and prepares the space for the proposed research to occupy an identified gap in that research. With the metabolic benefits associated with the variety of high intensity interval training protocols (Gibala & McGee, 2008) and the advantages of group based exercise (Faulkner et al., 2015; D. Simpson et al., 2017), it is suggested that combining the two could prove a viable option for those looking for a time-efficient and effective exercise option. Additionally, there has been the suggestion that exercise physiology provides the opportunity for an interface approach, due to its leanings towards a systems

approach (Warbrick et al., 2014). In this approach, it is proposed that the values of both empirical research and traditional or Indigenous knowledge are enhanced by one another. By acknowledging that this interface research space may offer benefits to a population who also reside in such a space, it is possible to engage this population in effective physical activity strategies (M. Durie, 2004a). Further discussion of these approaches will be delivered in the following chapter.

Chapter 3 : METHODOLOGY / RESEARCH APPROACH

3.1 Introduction

This chapter introduces, and contains a discussion of, the methodological approach and research design of the present study. An overview and background of the methodology underpinning this research project will be presented from a combined approach. There will be a brief discussion of an empirical approach to such a study and further discussion of Māori values and principles aligned with a range of Māori frameworks. This will lead into an argument for the use of an interface approach utilising exercise physiology methods.

Designing a study that is appropriate for a specific situation or population is largely determined by the purpose, questions and resources available (Bitchener, 2010). This is evident in the methodology employed in this work, which reflects the desire to incorporate a culturally appropriate and Māori-values approach to an empirical exercise physiology study. Discussion including the principles of kaupapa Māori research is important in that it identifies a vital set of values that may not be considered in similar non-Māori projects. Although not a mixed-methods study, this approach sought to apply the principles valued by Māori to an empirical research project. In the sections below there will be a brief discussion of both the scientific approach and a holistic/Indigenous or Māori approach. That discussion will then lead into how this project sits at the interface of both views of knowledge and how it aims to facilitate the trusted use of scientific methods for Māori research and the inclusion of Māori values into those methods.

3.2 Methodological Approach

3.2.1 Empirical

The reductionist view of Western science leads to the tendency to understand or explain behaviour by breaking it down into concepts or scientific units (Glynn & Scully, 2010; Merriam-Webster Dictionary, 2017), and health conditions and disease are often explained by understanding the pathology associated with an individual (Andersen, 2001; Glynn & Scully, 2010; Merriam-Webster Dictionary, 2017; R. Smith, 2003). The biomedical view or Western approach could, for example, consider the physiological implications of insufficient activity and design or promote an intervention based on increasing physical activity to minimise inactivity-related disease at a population level.

This same view could provide a better understanding of the physiological mechanisms of a related condition and/or an empirically designed intervention or pharmaceutical option to address the issue. However, the relationship of reduction of disease or inactivity to variables and molecular mechanisms is complex and does not always lead to conclusive explanations of pathology or viable solutions (Andersen, 2001). Such complexity can be seen in the underlying mechanisms of exercise behaviours themselves. These underlying mechanisms have been found to be uniquely unlike other health behaviours (Newsom, 2005) and therefore assumptions based on providing information about physical inactivity harms have not proved to have success globally (Dishman & Buckworth, 1996). Reductionism may therefore provide opportunities for examining behaviour and designing solutions in public health; however, there should be an acknowledgement that holistic approaches are also a vital part of the mix (Glynn & Scully, 2010).

The importance of a scientific understanding of physiological mechanisms is still entirely relevant, as it allows for a better understanding of the observation of trends (McArdle et al., 2015), which is the aim of this project. Legislative change and health policy are often motivated by physiological findings related to health problems, and the recommendations have informed many important health programmes (Booth, Gordon, Carlson, & Hamilton, 2000), such as smoke free law and water fluoridation. In the journey to discover a universal truth through research, it is evident that there have been clear divisions between Western science and Indigenous (or Māori) knowledge. Due to the holistic and spiritually entwined nature of Indigenous knowledge, as a research approach it is based on values often incongruent to Western science. Oftentimes, this incongruence has meant that the values of Māori and other Indigenous peoples has been devalued at the price of experimental research but also that the merits of Western science have been dismissed by Indigenous communities and researchers (M. Durie, 2004a). This is an important area for growth in the health sector as it has already been outlined that Māori experience huge disparities when it comes to health compared to non-Māori. The desire to expand knowledge and understanding around health and healthy behaviours is shared by both Western science and Indigenous communities; and thus, both knowledge bases should be genuinely valued. Māori have found issue with scientific research methods due to science's historical disregard for Indigenous knowledge and its dismissal of spiritual explanations (P. Harris & Mercier, 2006). The spiritual component of Indigenous knowledge is highly significant and an inseparable

part of the Indigenous view of health, along with the many other aspects of Indigenous knowledge valued by Indigenous peoples; but it has not been well regarded in scientific knowledge in the past. Fortunately, there is growing recognition that traditional and Indigenous knowledge is a unique expression of science (Hendry, 2014; K. P. Whyte, Brewer, & Johnson, 2016). Indigenous knowledge and Western science can be complementary (Ahuriri-Driscoll, 2007) and share the basic foundations of science whether obtaining knowledge is via conventional scientific methods or not (P. Harris & Mercier, 2006).

3.2.2 The Holistic Approach – Indigenous / Māori values

The Māori view of health, as described by many contemporary and traditional models of health, describes health as a balance between a number of aspects, in addition to physical or physiological conditions (M. Durie, 1994, 2004b). The World Health Organization (WHO) has defined health by taking a somewhat holistic view that emphasises the connection between all levels of social, psychological and biological health. Similar to contemporary Māori health models, it maintains that changes (or imbalances) to one can affect the others (World Health Organization, 2010b). The difference, however, is that Māori views of health include a spiritual aspect not mentioned by WHO. This spiritual dimension illustrates the link to atua (deities) and acknowledges the oldest genealogical connections to the environment through whakapapa (Heke, 2014; Marsden & Royal, 2003); this link is said to be a highly defining component of indigeneity (M. Durie, 1994).

As mentioned in previous chapters, Māori health and research models, such as Te Whare Tapa Wha, Te Pae Mahutonga and kaupapa Māori, emphasise the principles valued by Māori, which are an important consideration when undertaking any research or initiatives involving Māori. The root of kaupapa Māori, as described by Marsden, derives from the words *kau* (meaning to come into view or to appear for the first time), and *papa* (meaning ground or foundations). Together they form kaupapa in the sense of ground rules or general principles. Along with the general principles, tikanga describes the method, custom or the right way of doing things (Marsden & Henare, 1992; L. T. Smith, 1999), all of which may take on regional or contextual variations or interpretations, but share some overarching values (M. Durie, 2012). In addition to *tikanga* (protocols), *whanaungatanga* (valuing relationships), *manaakitanga* (showing respect or support), *tino rangatiratanga* (self-determination), and *kotahitanga* (solidarity) (Māori Dictionary, 2017a) are all values esteemed in both the research

spaces and in the implementation of relevant initiatives with Māori (A. Durie, 2001; M. Durie, 1994, 2004b).

The historical context of establishing a kaupapa Maori framework is rooted in the impact of the dominant discourses and research epistemologies being seen as racially biased (L. T. Smith, 1999). Concerns about the intentions of research raised expressions of mistrust and the fear that research on Māori did not address Māori concerns and perpetuated the legitimising of colonial practices, to the detriment of Māori development (Mutu, 1998). The misrepresentation of Māori culture and knowledge, and the marginalisation and undermining of Māori by colonially legitimised research, all led to a profound scepticism and the need to address the concerns around the negative impacts of such research (M. Durie & Kingi, 1998; Mutu, 1998). Kaupapa Māori was an opportunity to provide greater autonomy in the research space, and to deconstruct the dominant discourse that was seen to misrepresent and marginalise Māori (L. T. Smith, 1999).

Alongside contemporary Māori models of understanding health sits a framework based on a traditional understanding of the physical and spiritual world, and the relationship that people have with it. Whakapapa can be described as an illustration of genealogy but can also be viewed as a framework for understanding relationships and interconnectedness (Marsden & Henare, 1992; Marsden & Royal, 2003; Rāwiri, 2011). Māori survived and thrived within the challenging environment of pre-European Aotearoa by having a strong understanding of the world they lived in, their relationship with that environment and themselves, and by utilising an effective framework of sustaining and passing on that knowledge (Lange, 2011; Marsden & Royal, 2003). Whakapapa, in this capacity, describes this framework and can also be seen as a methodology for understanding, based on the principles outlined by Marsden, whereby fundamental knowledge is encapsulated into symbols or simple ways of viewing the world. He elaborates how these symbols or metaphors can illustrate another perceived reality, either as maps, models, prototypes or paradigms, which can reconcile the world in which we live (2003). In a more contemporary interpretation, these are principles of *Matauranga* (knowledge), *Whakapapa* (relationships or interconnection), *Huahuatau* (metaphor or examples from which to learn), and *Whakatinanatanga* (implementation or a manifestation of this knowledge) (Heke, 2014). These principles can inform national or regional health initiatives, and, indeed, the methodology of a research project.

3.2.3 The Interface

Translating Māori values into an empirical research study that resonates with Māori is feasible, contingent on the approach being underpinned by the values outlined above and acknowledging tikanga. At the interface of Māori (or Indigenous) research and science, the legitimacy of both is acknowledged rather than contesting the relative validities of each. Research at the interface can allow Māori and Indigenous researchers to use both systems as a source of inventiveness, and identify opportunities for the insights and methods of one to potentially enhance the other. Although the scientific method is known for its analysis into smaller and smaller components (reductionism), Indigenous knowledge emphasises an interacting whole being constructed out of multiple threads (holistic); and understanding research at the interface comes from an appreciation of a synthesis of components or their place within a system. Interface research is an attempt to use values and methods from two approaches, to provide a bridge between the benefits of each, but also to draw returns for a group of Indigenous people who may live at the interface (M. Durie, 2004a).

The realisation of an interface between the empirical and the holistic approach could be met by exercise physiology and an approach based on understanding, utilising and prioritising relationships and connectedness (in many forms) (Warbrick et al., 2014). Exercise physiology studies the changes to structures and functions of the human body when exposed to chronic or acute bouts of exercise (McArdle et al., 2015). Although it follows the protocols of scientific methodology, observation, experimentation and theory, its tendency towards more of a systems (or holistic) approach means it has the potential to suitably occupy and nurture the space between Western science and Indigenous knowledge. A supporting implication of exercise physiology's holistic or systems approach concludes that the study of exercise physiology has long been committed to the understanding of key biological responses and the interactions of organisation and integration at multiple levels (Joyner & Saltin, 2008). It is also important for research and the methods employed to make sense to Maori (M. Durie, 1994), so retaining a systems approach to understanding a whole body response; in this study's case, a perceptive response means it may be more appealing than other forms of scientific research.

Although exercise physiology seems obviously more aligned with just one aspect of Durie's four-dimensional health model, tinana or the physical dimension, there is much literature suggesting its influence across other aspects of hauora, including improving

mental health, whanau health and overall well-being (Fox, 2007; Penedo & Dahn, 2005). Maori are well aware of the relationship that physical activity or exercise has with well-being, with a well-known whakatauki describing the effects of inactivity succinctly: *Tama tu, tama ora. Tama noho, tama mate*. Its translation in the simplest terms can be seen as a direct encouragement to live an active life in place of being lazy or still, which can lead to sickness or death. Such a direct endorsement of activity and physical health has been adopted in a contemporary translation, by the Māori Physical Activity and Nutrition organisation, Toi Tangata, to mean (but not be limited to) “through physical wellbeing we thrive” (Toi Tangata, 2013).

Regardless of the acute response to physiological markers or any other molecular explanation, the simplicity of the benefits of physical activity and exercise are summed up appropriately by the whakatauki mentioned above, and the comprehensive literature informing and endorsing it (Pescatello et al., 2014; World Health Organization, 2010b). But by understanding specifics of physiological responses in Māori, it gives us the opportunity to better understand those types and quantities of exercise that could best benefit Maori (Booth et al., 2000). Therefore, with an understanding that the underlying principle of most Māori frameworks of understanding health and well-being is around relationships (whether interpersonal, environmental, spiritual or otherwise), the approach taken with this present study aims to prioritise identifying, establishing and/or maintaining relationships in the research process and results, with participants and beyond. As an aspiring Māori health researcher, I hope to be able to emphasise the importance and relevance of both a Māori and empirical approach, such as exercise physiology. Thus, ways are identified in which to engage, incite positive change, and practically improve health, fitness and well-being of Māori.

The opportunity afforded by research at the interface of Māori knowledge and science (exercise physiology) is, I believe, reiterated by another relevant whakatauki: “*Titiro whakamuri hei ārahi i ngā uaratanga kei te kimihia*”. The suggestion is to look to the past for guidance while seeking out what to do. However, the implication that can be interpreted is that traditional knowledge can inform the values and approach you take, while new, innovative or different methods can also add value to what you do.

3.3 Conclusion

This chapter has discussed the background to the approach used in this study. With reference to the empirical approach, the Māori approach, and the way in which the

values of both can meet at the interface, this section has outlined the approach taken and the rationale behind it. The real-world setting aligned with this study aimed to enable an approach that reflected participants more than that of a researcher.

Chapter 5 : METHODS – PERCEPTIVE DATA

5.1 Introduction

This chapter outlines the methods employed for the collection of perceptive data and justification for the use of those, and previously mentioned methods. These methods will be described and compared to similar previous research. Following on, an explanation of the procedures for data collection will include a description of those involved in the study (sample size and characteristics), the location, context and any ethical issues relevant to the sample. The tools and materials used in data collection will also be discussed with regard to their reliability and validity in measuring the variables involved. The steps involved in the data collection process will be described and the procedures will be justified by highlighting the advantages and outlining any relevant disadvantages in relation to the research aim. Finally, the data analysis procedures will be explained with an outline and justification. The separate sections used to describe these methods is due to the formatting required of the article presented as the previous chapter.

5.2 Approach

This study was designed to examine acute responses to an adapted HIIT protocol utilising body-weight, resistance, and dynamic conditioning exercises. This chapter will outline the methods relevant to perceptive responses. Data of interest related to perceptive responses include a range of measures of intensity (also mentioned in the previous chapter), affect (FS), exercise task self-efficacy, intentions, and enjoyment.

5.2.1 Consultation

Consultation was sought with Māori health organisations: Te Whānau o Waipareira and Toi Tangata; and several other community-based organisations, including Ranui Community Centre, Ranui Action Project, McLaren Park Henderson South (MPHS) Hub West, and Whitiki Maurea (Māori Community Mental Health team). Most consultations with local groups were met with interest and initial openness to engage, but due to time-constraints, and, with the example of Te Whānau o Waipareira, a pilot group was being initiated around the same time as my research, so partnership was deemed unmanageable at the time. MPHS (the venue used for this research) assisted by offering reduced venue hire and flexibility with the use of their space, and staff and associated groups were invited to join in workouts, but they were not required to

participate in the research aspect. Initial contact with Toi Tangata, a national Māori organisation specialising in physical activity and nutrition, would instigate an ongoing relationship. Alongside the initial support with regard to appropriate approaches to research involving Māori, the relationship with Toi Tangata would eventuate in a Summer Internship, where I was able to learn and engage more profoundly in te ao Māori and the approaches of Māori organisations. The internship with Toi Tangata allowed me to conduct a project on their behalf, present my learning at their recent symposium and develop relationships with a range of practitioners, communities and services.

5.2.2 Location

A local community centre was utilised for its convenience for participants, cost effectiveness, and flexibility in using indoor or outdoor spaces where appropriate. Participants lived in the surrounding suburbs of Henderson, Titirangi, and Ranui, which are all within a 10-15 minute drive. The community space was also used for a range of other community activities including Zumba™, yoga and mindfulness classes throughout the week.

5.3 Participants (Wāhine)

See Section 4.5

5.4 Procedure

Prior to the commencement of any familiarisation or acute response trials, all participants' physical activity levels were assessed using an adapted physical activity questionnaire, where participants estimated the number of days per week they achieved 30 minutes or more of physical activity, moderate intensity exercise and vigorous intensity exercise; and how many minutes of moderate intensity exercise, and vigorous intensity exercise they achieved (on average from the past month). Participants were asked to complete the same questionnaire one month after the completion of response trials to note any changes to behaviour. Further procedures are outlined in Section 4.6.

5.4.1 Whakawhanaungatanga

Wāhine who attended an initial information hui were greeted with a short mihi (welcoming speech) including the researcher's pepeha (introduction establishing identity and heritage), and wāhine were given the opportunity to introduce themselves to the researcher and the group in a manner that was comfortable for them. This process

is integral to establishing a sense of whakawhanaungatanga (kinship or relationships with each other) and identifying familial, hapu or iwi (sub-tribe or tribal) links. Highlighting these relationships, shared experiences and recognition that participants would be treated like whanau, aimed to enhance rapport but also encourage the sense of accountability to each other (Bishop, 1996; Warbrick et al., 2016).

Those wāhine who were unable to attend an information hui were met individually at a venue of their choice. This would be at either their home or at the local community centre. These wāhine would also be given a short mihi and an opportunity to introduce themselves. This acknowledgement of whakawhanaungatanga was effective in identifying several links to one other (between participants and with the researcher).

5.4.2 Manaakitanga

After each information hui, *kai/kapū ti* (food and drink) was offered to wāhine as a part of a cultural practice to instil a sense of hospitality, but also as a conclusion of the *whakanoa* (making ordinary), often described as a lifting of *tapu* (in this case the caution and awkwardness of a first meeting) associated with ceremonies or occasions (Māori Dictionary, 2017b). The sharing of kai, as with many other cultures, symbolises the binding of the two groups (in this case the participants and the researcher), where the two are now merged under a shared purpose. The two groups are often referred to as *tangata whenua* and *manuhiri*, in more formal hui or ceremonies, but the initial hui was meant to be informal, flexible and more approachable for those less engaged with te ao Māori (the Māori worldview). It was acknowledged early on, that reciprocity was important and that what would be contributed by wāhine, specifically their knowledge, opinions and time, would be treated as taonga (a treasure) and was as important (if not more important) to the outcome of the project than that of the researcher. Wāhine also acknowledged that the training provided would be a valued opportunity to improve their physical activity levels and exercise knowledge. Further *manaaki* (support) was offered in the form of transport; most participants had appropriate transport to attend sessions, but some were offered a ride to and from training sessions. Wāhine were also made aware that *tamariki* (children) were welcome to attend sessions, if alternate childcare was not available; this often resulted in tamariki watching their mums as they trained.

5.4.3 Progressive Familiarisation Period.

See Section 4.6.1.

5.4.4 Acute Response Session

See Section 4.6.2.

When possible, wāhine would be exercising at the same time, and resting accordingly. This was deliberately designed to acknowledge the principle of kotahitanga, or the sense of solidarity or unity in the collective act of the exercise (Māori Dictionary, 2017a).

Table 1 details the structure of the exercise protocol.

Table 1. Structure of exercise protocol.

Exercise	Number of sets	Exercise duration	Rest duration
Squat	4	30s	30s
Push	4	30s	30s
Rope	4	30s	30s
Hinge	4	30s	30s
Pull	4	30s	30s
Session	20	10 min	10 min

5.4.5 Data Collection Procedure During Exercise

Exercise Intensity

The monitoring of exercise intensity utilised HR and RPE (Category-Ratio 10 Scale [CR10]) (G. Borg, 1998) during the workouts, and SC and BL pre-, post-, and 20-min post-trial. This is outlined further in Section 4.6.2. Figure 1 displays the RPE scale used to assign subjective intensity responses.

0	Nothing at all
1	Very weak / light
2	Weak
3	Moderate
4	
5	Strong / Heavy
6	
7	Very strong
8	
9	
10	Extremely strong / strongest

Figure 1: Borg CR10 RPE Scale

Justification of Intensity Measures

The use of variables based on both the psychological concept of perceived exertion and physiological variables has been widely researched, and has been found to provide useful complementary data regarding exercise intensity (G. Borg, 1982, 1998; Daijiro, Takayoshi, Hatsumi, Koji, & Yoshiyuki, 2015; McGuigan, Egan, & Foster, 2004; Noble, Borg, Jacobs, Ceci, & Kaiser, 1983; Zamunér et al., 2011). Borg explained that overall perceived exertion is linked to a range of different cues, including psychological, and physiological factors related to skin, muscles, joints, and more central factors, such as cardiovascular and pulmonary working mechanisms (G. Borg, 1982). Therefore, participants in our study were instructed to consider their overall perceived exertion, not just localised fatigue or pain in certain muscles or body parts. The correlation between perceived exertion and HR and BL is well documented. The HR response's relationship with oxygen demand in the muscles is regarded as a central factor associated with RPE, while the role of BL in muscle fatigue and exercise-related pain means BL is related to localised factors associated with RPE. The use of the CR10 RPE scale is a simple, standard method in the evaluation of perceived exertion of exercise and has been validated against other objective measures of exercise intensity, such as HR, BL and cortisol (E. Borg & Kaijser, 2006; Daijiro et al., 2015; McGuigan et al., 2004; Noble et al., 1983).

The physiological or objective measures used in this present study are linked to intensity in a range of ways. Blood lactate is sensitive to changes in the intensity and duration of exercise, across a range of training modes (Beneke, Leithäuser, & Ochentel,

2011), and is associated with gluconeogenesis and tissue metabolism coordination (Brooks, 2009). Cortisol, as a principal glucocorticoid, plays an important role in metabolism and immunity, but is also responsive to acute exercise (Brooks et al., 2005). Cortisol is known to be altered by a range of training modes, and changes to intensity, volume and workload are also known to influence cortisol response. The less invasive use of salivary cortisol measures avoids the discomfort and expense of venepuncture, and has shown to be a valid and reliable indication of serum cortisol level (Kirschbaum & Hellhammer). Delineation between high and low intensity exercise has also been shown specifically in resistance training (McGuigan et al., 2004). Because cortisol has also been found to be linked to circadian rhythm, all testing was conducted around the same time in the early evening (between 6pm and 7.30pm).

Affect

The Feeling Scale (FS) is a one-item measure used to assess the general affective valence of participants, in this case the pleasure or displeasure in response to exercise (Hardy & Rejeski, 1989). This instrument has been found to facilitate the assessment of in-task feelings and has been used extensively in previous studies examining the affective response during acute exercise (Decker & Ekkekakis, 2017; P. Ekkekakis et al., 2011; P. Ekkekakis & Petruzzello, 1999). Affect was assessed during exercise (at prescribed intervals immediately concluding a work set), and as a session measure (at the end of the workout concluding the cool down period). The FS uses an 11-point bipolar scale ranging from -5 (“Very bad”) to +5 (“Very good”), with further anchors throughout to assist with rating. A wealth of research has been dedicated to investigate the suspected “causal chain” between exercise intensity, affective response, and exercise adherence, and the use of the FS is a constant instrument of use (Decker & Ekkekakis, 2017; P. Ekkekakis et al., 2008; Legrand, Joly, & Bertucci, 2015). At the beginning of exercise, participants were given the following instructions: “When asked please state how you feel at the current moment using the scale provided. It is common for feelings of pleasure or displeasure to fluctuate across time, so you might feel good and bad at different times during exercise”. Participants were shown a diagram displaying the Feeling Scale with the seven anchors: -5 (Very bad), -3 (Bad), -1 (Fairly Bad), 0 (Neutral), +1 (Fairly Good), +3 (Good), and +5 (Very Good). Participants were also asked to rate their feeling at the end of the exercise cool down by responding to the cue: “How do you feel about the workout session you just completed”.

5.4.6 Data Collection Procedure Post-Exercise

A copy of the questionnaire used for these post-trial perceptive measures is attached in Appendix F.

Exercise Task Self-Efficacy

Self-efficacy in relation to exercise has been used to describe someone's confidence in their ability to perform actions required to achieve an outcome. In the pursuit of improving physical activity levels, self-efficacy has been a crucial variable in the different theoretical approaches. With strong associations with behaviour change, self-efficacy's predictive strength depends greatly on specific aspects of the behaviour of interest, in this case, exercise (A. Bandura, 1997). The following scale was adapted from a previous similar study (Jung et al., 2014) and informed by Bandura (2006).

After 20 minutes from the conclusion of the workout, participants were asked to rate their confidence in their ability to repeat the exercise they just completed, using a 3-item measure. Using the stem, "How confident are you that you can..." The 3-items were:

- 1) "perform one bout of exercise a week for the next 4 weeks that is just like the one you completed today?"
- 2) "perform two bouts of exercise a week for the next 4 weeks that is just like the one you completed today?"
- 3) "perform three bouts of exercise a week for the next 4 weeks that is just like the one you completed today?"

A scale of 0% (Not at all) to 100% (Extremely confident) in 10% increments was used to score responses. This was based on self-efficacy specificity recommendations (A. Bandura, 1997) in previous work by Jung (Jung et al., 2014), who utilised a 5-item measure, but it was deemed superfluous as the exercise protocol used in this study would not be suggested to be prescribed so frequently.

Exercise Intentions

Using a 3-item measure, participants were asked to rate their intentions to engage in the exercise they just completed over the next 4 weeks. They were assessed 20-minutes post-exercise, and the participants were specifically asked "Please rate the extent to which you agree with the following statements".

- 1) "I intend to engage in the type of exercise I performed today at least once a week,

- 2) “I intend to engage in the type of exercise I performed today at least twice a week and
- 3) “I intend to engage in the type of exercise I performed today at least three times a week during the next month”.

Using a 7-point rating scale, responses were scored from 1 (“Very unlikely”) to 4 (“Neutral”) to 7 (“Very likely”).

Exercise Enjoyment

Using a modified version of the Physical Activity Enjoyments Scale (PACES) (Kendzierski & DeCarlo, 1991) 20-minutes post-exercise, participants were asked to rate their enjoyment of the exercise trial. Enjoyment was scored on a 7-point bipolar scale across a 17-item measure. The modification of the scale was made to accommodate the timing of the assessment being 20 minutes after the exercise was completed. One of the original 18 items was deleted due to its irrelevance to our study, and the phrasing of the items were adjusted to appropriately reflect the timing of the enjoyment assessment. Items were summed and an overall enjoyment score was produced (maximum score of 119). Items are bipolar, and some questions are negatively worded to avoid acquiescent bias, or the tendency to agree with all or most statements (Lewis & Sauro, 2009). This scale has been widely used in the evaluation of emotional enjoyment of physical activity (Jekauc, Voelkle, Wagner, Mewes, & Woll, 2013; Jung et al., 2014). Evidence of validity exists in relation to PACES scores and future choice of activity, along with a significant negative correlation to a scale measuring boredom-proneness (Kendzierski & DeCarlo, 1991).

Approach to the Intervention

One final measure was used, which asked participants to rate their enjoyment of specific aspects of the intervention. This 5-item measure was created especially for this study and aimed to identify some of the aspects specific to it that were enjoyable or not, for participants. The items included:

- 1) The specific workout design (exercises / timing)
- 2) The group environment of the workout
- 3) The Māori values approach taken to the exercise study
- 4) Working out with a group of wāhine at a similar activity level to yourself
- 5) The location of the workouts.

Participants were asked to rate their enjoyment from 1 (Not enjoyable at all) to 7 (Very Enjoyable).

5.5 Data Analysis

Statistical analysis is described in Section 4.7. Where data was not found to be normally distributed, Wilcoxon Signed Rank tests were conducted for within group differences for self-efficacy and exercise intention data. Cohen's d was used to determine effect size (ES) for mean difference in self-efficacy and exercise intention responses. Effect size criteria for self-efficacy and exercise intention was expressed as 0.1 = small effect, 0.3 = medium effect, 0.5 = large effect (Cohen, 1988).

5.6 Conclusion

This chapter has outlined the methods employed by this study, that range from validated scales to measuring affective valence, enjoyment, self-efficacy and exercise intentions. The physiological measures associated with exercise intensity were outlined in the preceding chapter and the combined use of these measures was applied in order to attain a range of data that could be applied to potential chronic adaptations and future exercise behaviours.

Chapter 6 : PERCEPTIVE RESULTS

6.1 Introduction

This chapter will detail the findings related to affect, enjoyment, self-efficacy and exercise intentions.

A total of 14 women completed the acute response session. The figure below (Figure 2) presents group means for affective responses (FS) over the five exercise stations and mean session FS.

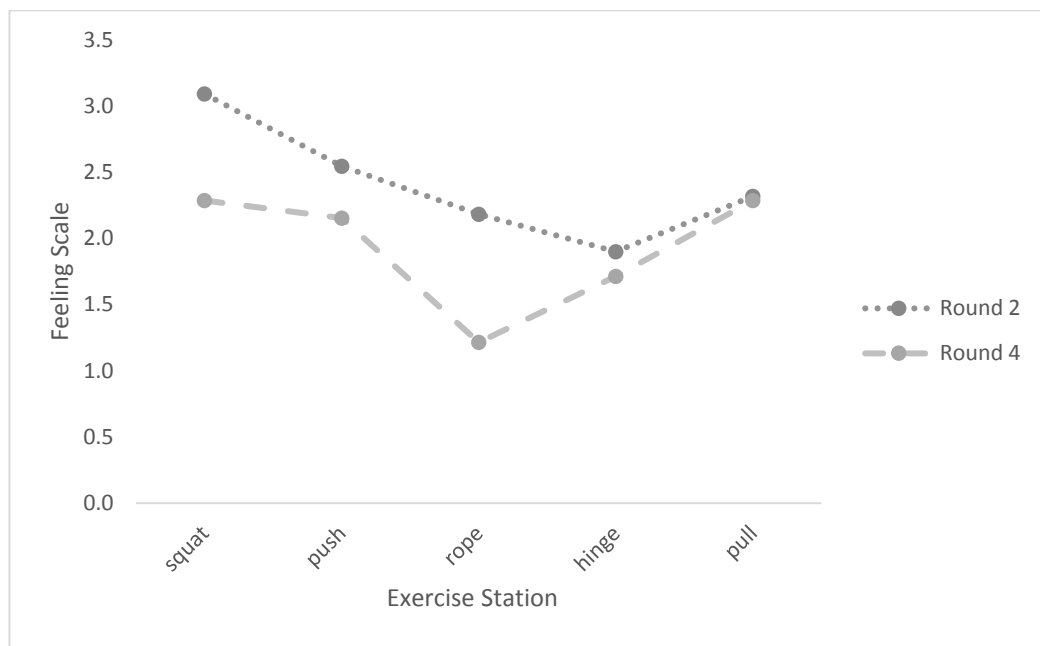


Figure 2. Mean FS rating for each exercise station for both rounds recorded

6.2 Affect During Exercise

In order to assess the affective response to this exercise protocol, FS responses were recorded with each exercise station (Squat, Push, Rope, Hinge, and Pull) at two separate work sets (2 and 4). Figure 3 below displays the mean FS response along with the mean RPE response across the two rounds being recorded.

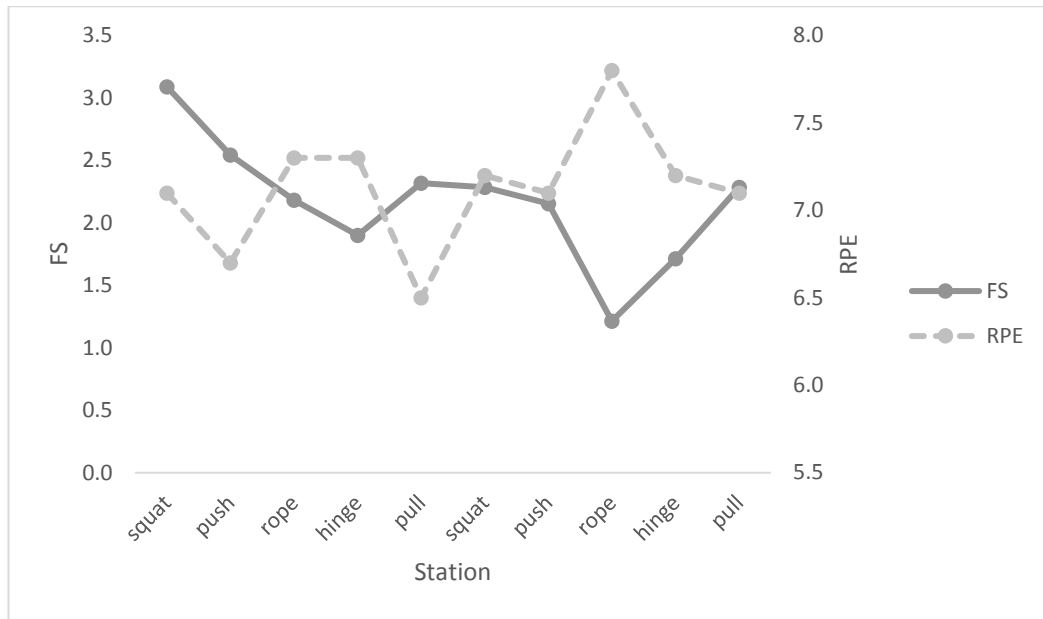


Figure 3. FS and RPE responses during F.I.T. exercise protocol.

6.3 Session Affect

The mean FS response to the overall session (3.5 ± 1.9) was rated as more positive than the mean in-session responses (2.0 ± 1.7). Table 2 details the affective response (FS) across the five exercise stations and the two rounds that were recorded.

Table 2. Mean (\pm SD) affective response to each exercise station in both the 2nd and 4th work sets. FS response to session.

	<u>Round 2</u>		<u>Round 4</u>		<u>Overall</u>	
	Mean	SD	Mean	SD	Mean	SD
Squat	3.1 \pm 1.6		2.3 \pm 2.1		2.6 \pm 1.9	
Push	2.4 \pm 2.3		2.2 \pm 2.5		2.3 \pm 2.5	
Rope	2.1 \pm 2.0		1.2 \pm 2.4		1.6 \pm 2.3	
Hinge	2.0 \pm 2.4		1.4 \pm 2.8		1.8 \pm 2.5	
Pull	2.2 \pm 2.3		2.5 \pm 2.1		2.3 \pm 2.2	
<i>Session</i>					3.5 \pm 1.9	

6.4 Exercise Task Self-Efficacy / Exercise Intentions

A Wilcoxon Signed Rank Test revealed significantly lower self-efficacy between participants' reported confidence in their ability to perform the exercise in the next four weeks: three times per week ($70 \pm 30.4\%$), compared to their confidence to perform the exercise once a week ($89.3 \pm 18.2\%$), $z = -2.71$, $p < 0.01$, with a large effect size ($r = 0.52$) or twice a week ($87.1 \pm 20.2\%$), $z = -2.68$, $p < 0.01$, with a large effect size ($r =$

0.51). The same test revealed a lower degree of intention to perform the exercise three times per week (5.1 ± 1.4) over the next four weeks compared to once a week (6.4 ± 0.9), $z = -2.59$, $p < 0.01$, with a large effect size ($r = 0.48$) or twice a week (5.9 ± 1.1), $z = -2.70$, $p < 0.001$, with a large effect size (0.52). Mean responses to participants' confidence in their ability to perform, and intentions to perform bouts of exercise in the next four weeks, either once, twice, or three times per week is illustrated in Figure 4.

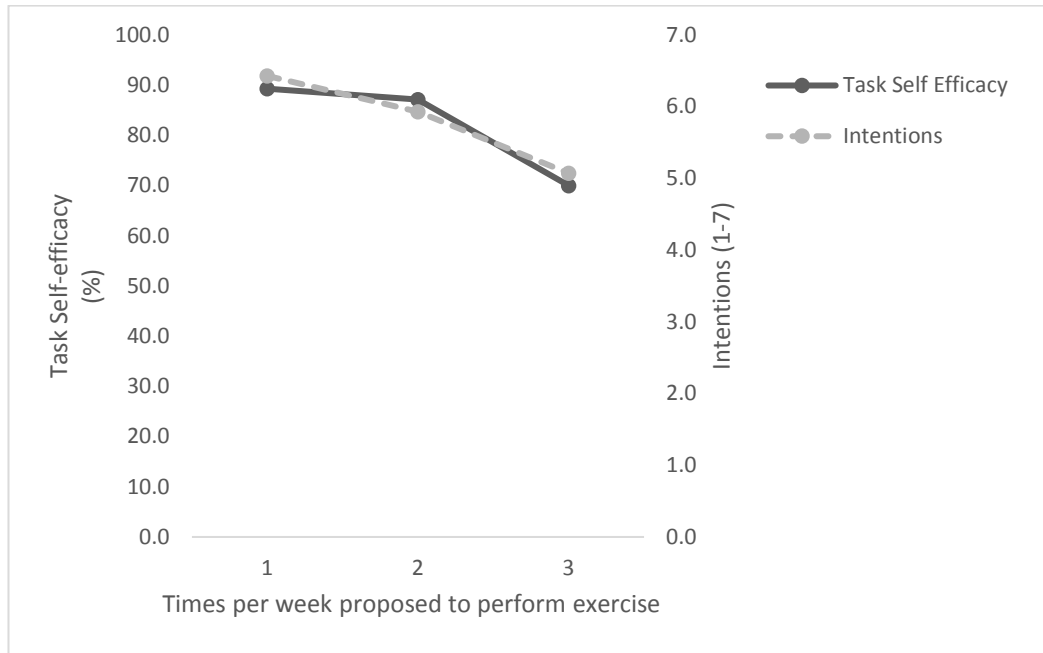


Figure 4. Participants' mean responses to questions about task self-efficacy and intentions to perform exercise once, twice or three times per week, for the next four weeks.

6.5 Exercise Enjoyment

Mean response to exercise enjoyment was 92.8 ± 10.2 (out of a maximum score of 119).

6.6 Enjoyment of Aspects of F.I.T

Mean response to specific aspects of F.I.T. Wāhine intervention are detailed in Table 3.

Table 3. Mean response to specific aspects of the study – rating scale from 1 (Not enjoyable) to 7 (Very enjoyable).

	Enjoyment (1-7)	
	Mean	SD
The specific workout design (exercises / timing)	6.4	± 0.8
The group environment of the workout	6.6	± 0.6
The Māori values approach taken to the exercise study	6.4	± 0.9
Working out with a group of wāhine at a similar activity level to yourself	6.9	± 0.4
The location of the workouts	6.6	± 0.8

6.7 Weekly Physical Activity

Follow-up data was insufficient so the analysis of changes to physical activity and exercise behaviour were not completed.

Chapter 7 : DISCUSSION

7.1 Introduction

This chapter interprets the findings of this current study and compares those findings with previous relevant research. The results discussed will relate to those perceptive results outlined in the previous chapter, as physiological data has already been discussed and interpreted in the article presented as Chapter 4. This chapter will consider the implication of these findings in relation to the research aims of this study, identify any limitations, and potential practical applications to future research or physical activity initiatives.

7.2 Discussion of Perceptive Findings

The tendency for public health and physical activity initiatives to advocate for the use of moderate intensity or steady state exercise over high intensity sessions is partly based on the premise that there is a negative relationship between affect and exercise at certain intensities (Garber et al., 2011). Although this negative relationship has been shown in several studies (Panteleimon Ekkekakis et al., 2004; P. Ekkekakis & Petruzzello, 1999; Hall et al., 2002), the potential influence of intermittent exercise at high intensities is only recently garnering more attention (Jung et al., 2014; Martinez et al., 2015).

Our present study did not compare perceptive responses of our adapted HIIT protocol to an additional exercise regime, but reports of positive affect and implications of high enjoyment levels are promising for future application. In contrast to the understood negative relationship between affect and exercise intensity (P. Ekkekakis, 2003), our results point to the ability for a group of previously inactive Māori women to report positive affect and enjoyment of an exercise modality rated as “Very hard” during and after exercise. Recent trials comparing a low volume cycle HIIT protocol (1-minute at 100% peak power output [W_{peak}] and 1-minute at 20% W_{peak} for 20 minutes) with continuous exercise at moderate (CMI) and vigorous (CVI) intensities provide some support for the idea that the intermittent nature of HIIT may provoke a more pleasurable response than continuous vigorous intensity exercise. Although the study described hypothesised similar affect scores between HIIT and CMI, their actual reported responses showed HIIT to be less pleasurable than CMI, both during and after exercise (Jung et al., 2014). Another more recent study showed that HIIT (1-minute bouts of cycling at 85% maximal workload [W_{max}] interspersed by 1-minute of recovery at

25% Wmax) elicits higher enjoyment (103.8 ± 9.4) than moderate intensity continuous exercise (MICT) (84.2 ± 19.1), and it was reported that 92% of participants preferred and enjoyed HIIT compared to MICT, using an 18-item PACES tool (Thum et al., 2017). Compared to our results regarding intensity, this recent study (Thum et al., 2017) elicited peak HR ($89\%HR_{max}$) similar to our mean HR ($85.2 \pm 7.2\%HR_{max}$) and mean RPE responses peaked ~ 7 similar to our mean RPE 7.1 ± 1.0 ; however, mean BL levels peaked at higher levels than our results ($\sim 10\text{mmol}$). Those more elevated BL levels may begin to explain the consequent reduced reported affect over time in their HIIT regime, as outlined previously by the negative relationship between exercise intensity and affect, as a result of exceeding certain physiological landmarks (P. Ekkekakis, 2003).

Another recent study examining the enjoyment, adherence, and intentions with high intensity functional training (HIFT, also known as Crossfit™) and moderate intensity training (combined aerobic and full-body resistance training) found that HIFT participants spent a significantly lower amount of time exercising per week while still maintaining exercise enjoyment and intentions to continue (Heinrich et al., 2014). However, exercise enjoyment and intentions were measured on a 1-item scale, which is considered less reliable than a multi-item scale such as the 17-item and 3-item scale we utilised (P. Ekkekakis, 2003). Our participants also reported reasonably high confidence in their ability to perform, and intentions to perform bouts of the prescribed exercise in the future. Although the mean confidence in their ability to perform three bouts of the exercise per week, for the next four weeks, was significantly lower than once per week ($89.3 \pm 18.2\%$, $p < 0.01$) or twice per week ($87.1 \pm 20.2\%$, $p < 0.01$), mean confidence for three bouts per week are still rated as $70 (\pm 30.4\%)$. Jung et al. reported that although there were differences between the affect scores of HIIT and CMI modalities, participants reported feeling just as confident in their ability to perform HIIT as they did CMI. It appears from their report that there may be specific characteristics of HIIT that encourage self-efficacy, that do occur with CVI (2014).

The idea of HIIT's special characteristics encouraging self-efficacy is further bolstered by the results of a study examining the adherence of prediabetic participants to independent exercise after a brief supervised laboratory intervention. This study identified that adherence to HIIT ($89 \pm 11\%$) was greater than moderate intensity continuous training ($71 \pm 31\%$) in free-living conditions, as assessed by self-reports from participants ($P = 0.05$) (Jung et al., 2015). The potential for free-living adherence

to HIIT, as reported by Jung et al., provides additional support for the suggestion that HIIT provides, not only additional metabolic benefits to at-risk populations (Janssen & Ross, 2012), but also is a viable alternative for such populations to adhere to independently (Jung et al., 2015).

Similar to self-efficacy responses, participants reported a significantly lower degree of intention to perform the exercise three times per week (5.1 ± 1.4) for the next four weeks (on a scale of 1 – 7), compared to intentions to perform once a week (6.4 ± 0.9 , $p < 0.01$) or twice a week (5.9 ± 1.1 , $p = 0.01$). As with reported self-efficacy, participants' mean degree of intention to perform the exercise three times per week was still positive. Our questions did not define how participants intended to perform the exercise, outside of the intervention space, and considering the previous discussion around benefits of group exercise, cultural considerations and social factors, it can be inferred that participants' intentions may only be realised in actual activity if the environment remains available for them to do so. Consequently, although not recorded as part of this study, there were several participants who indeed returned and continued to participate in exercise sessions with subsequent groups, as so-called *tuakana* (or graduated participants) to the *teina* (new recruits or beginners). The *tuakana-teina* (older sibling-younger sibling) principle is paramount in te ao Māori, as an opportunity, in this case, for experienced participants to assist inexperienced participants with a sense of leadership and encouragement, whether explicit or not. This principle is also acknowledged in terms of the relationships and roles of participants and researchers, occupying the space of both *tuakana* and *teina* at different times (Walker, 2004).

Many of the findings of this present study are promising for application to public health initiatives when considered alongside previously cited theory. Hedonic theory, which proposes that people are likely to do what brings them pleasure while avoiding that which brings about displeasure (Cabanac, 1971), is contentious as some of the above cited studies report low affective valence or relative low pleasure in response to HIIT; however, the studies also report intentions to perform that exercise and/or adherence to that exercise. The aforementioned dual-mode theory (DMT) relates to an assumption that the affective response to aerobic exercise is linked to specific physiological processes, going so far as to describe affective response as “adaptive responses that signal survival-critical metabolic changes in the body” (Hall et al., 2002, p. 52). It suggests that the displeasure aroused during exercise is due to such influences as hyperventilation and increased blood lactate, meaning activity that exceeds certain

metabolic landmarks may reduce engagement in similar activity in the future (Panteleimon Ekkekakis et al., 2004; P. Ekkekakis & Petruzzello, 1999). Our participants reported both positive affective valence, confidence in their ability to perform, and intentions to perform the exercise despite the intensity of exercise also being rated as “Very Heavy” or “Very Hard” and eliciting physiological responses well above that of a moderate intensity. It is then possible that the positive affect reported by our participants may be accounted for by more than just the intensity of exercise performed. Other considerations of influence may include the short work to rest intervals, varied muscle-groups and exercises used, or implementation of a culturally appropriate approach in a real-world setting.

In addition to the validated scales utilised in this study, the participants were also asked about their enjoyment of specific aspects of the intervention. Although questions were related directly to the F.I.T. Wāhine intervention and had not been validated previously, the aim in including these additional measures was to identify responses to specific aspects of the research process. One of the questions addressed the use of Māori values in the approach to the research process, which is considered to be of importance when working with Māori (M. Durie, 2004a, 2004b; L. T. Smith, 1999). The appreciation of a similar approach to an exercise intervention was reported in an evaluation of a nine-week fat-loss challenge (*hinu wero*) run by a social enterprise called Patu™. The sense of *whanaungatanga* and support offered to participants was a regular theme and was noted as an enabler/motivator in the challenge, which incorporated HIIT, *tikanga* Māori and healthy lifestyle education (Forrest et al., 2016). Similarly, the group dynamic and sense of team work (previously referred to as *kotahitanga* or a sense of unity or solidarity) was a reported theme with the Patu™ evaluation, and was also an aspect enjoyed by F.I.T. Wāhine participants. More specifically, the sense of working out with a group of women of similar fitness or activity level scored highly on the 7-point scale with our participants (6.9 ± 0.4).

Group exercise and community-based exercise interventions have long been utilised to encourage participation in physical activity and exercise, but the impact of the group or community-based dynamic on affective responses in a study like ours is unclear. Few studies have examined acute responses to HIIT or circuit interval training in a community-based group setting, and most other real-world or field-based research involves athletes, sports teams or trained individuals (Buchheit & Laursen, 2013; Davies et al., 2016). The theoretical justifications and previous studies validating the

use of group-based exercise (Beauchamp et al., 2007; Belza et al., 2006) include self-determination theory (SDT), which has demonstrated strong evidence for group exercise participation in relation to meeting basic psychological needs (Baumeister & Leary, 1995; Deci & Ryan, 2000; Edmunds et al., 2006). One of the main facets of SDT considers the need to feel connected to others or *relatedness*, and has been found to influence motivation and intentions to engage in future behaviour (Ryan & Deci, 2006). The sense of social support is also known to contribute to community-based group interventions (Belza et al., 2006; Hunt et al., 2014) as mentioned in relation to whanaungatanga being a strong motivator in the Patu™ evaluation (Forrest et al., 2016).

Furthermore, a Māori whānau resiliency framework, described in *Whakaoranga Whānau, Whānau resilience*, identifies themes related to whānau resilience that could be translated to relate to self-efficacy and fostering positive health behaviours, such as physical activity. The themes include *Whanaungatanga* factors (networks and relationships), *Pūkenga* factors (abilities and skills), *Tikanga* factors (meanings, values and beliefs), and *Tuakiriri-ā-iwi* (security in cultural identity) (Waiti & Kingi, 2014). Many of these themes can be aligned with the aspects of our study. *Pūkenga* factors align with the participants being able to feel comfortable and enjoy working-out with wāhine with similar exercise abilities. It also relates to the participants' adding new skills and experiences that might transfer to other contexts or situations that they encounter. *Tikanga* and *whanaungatanga* have previously been alluded to, but in the context of our study would relate to the values that guided the approach and the relationships built throughout. Although not a directly related framework, the concept of resilience seems pertinent in relation to participants' self-efficacy, intentions, and experiences related to this study.

7.3 Limitations and Considerations

The principal limitation of this study is that we did not include a comparison group via an additional exercise regime, such as moderate intensity aerobic training. It was determined that the breadth of work on both the physiological and perceptive responses to moderate intensity exercise was significant, and the constraints of the study parameters would favour preliminary examination of the F.I.T. protocol on its own initially. Further work could include an additional exercise modality for comparison or varied work to rest ratios. However, the aim of this research was to identify whether an adapted protocol, using both shorter work to rest intervals (30 seconds) and incorporating whole-body resistance and alternative conditioning exercises in a circuit

format, would elicit sufficient acute physiological responses for potential long-term adaptation. Additionally, we wanted to examine the perceptive response to such an adapted HIIT protocol to then suggest that that efficacy could present an enjoyable and potentially promising alternative for public health application.

The use of a real-world setting, in place of a controlled laboratory, could be viewed as a limitation of this current study, but we believe that the setting would better represent an environment that aligned with the lives and values of our participants. The intent was to utilise equipment, measures, venue, and an approach that would be easily transferrable to a real-world setting; however, this meant a shift from the laboratory trial standard. Despite the deviation from laboratory protocol and control, the view of this study was to attempt to avoid the very aspects inherent in experimental design that might contribute to a lack of translatability, especially among a cohort whose historical experience of Western science's approach to research has been damaging (M. Durie & Kingi, 1998; Mutu, 1998). This included factors such as use of the local community centre, informal approach to familiarisation sessions, and flexibility afforded to participants to self-select exercise variations to suit individual needs/preferences; also, values of whanaungatanga and manaakitanga were key throughout the process.

7.4 Practical Application

Preliminary findings of this research provide an impetus for an adapted HIIT protocol, such as ours, being an effective and enjoyable strategy for improving metabolic health in a population at a disproportionate risk of metabolic illness. By providing a time-efficient and effective exercise alternative to a group of previously inactive women, in a manner that facilitates engagement, acknowledges cultural values, and provides variation, F.I.T. Wāhine is an opportunity to inform further work in similar relevant approaches. The application of culturally relevant approaches to an exercise modality that incorporates the benefits of whole body resistance-based, body-weight and conditioning exercises, could inform further work into improving the uptake and adherence of potential physical activity recommendations.

It is apparent from these findings that a previously inactive sample of Māori women, from a range of ages, physical characteristics, and backgrounds are able to self-select appropriate intensities with a range of functional whole-body exercise, with as little as four weeks of progressive familiarisation. There is potential for this type of exercise to

be utilised in public health initiatives, with relatively easy implementation in a community setting.

Chapter 8 : CONCLUSION

The primary purpose of the study was to identify the acute physiological and perceptible responses to “short, sharp” exercise with inactive Māori women in a community-based setting, in a culturally considered way. The adapted high intensity interval training protocol included compound resistance, bodyweight and conditioning exercise in an inclusive community setting over a 4-week period was utilised. It aimed to understand whether this mode of exercise is feasible in its efficacy, affective responses and enjoyment for a previously inactive population, using an approach at the interface of Māori and empirical research. By structuring an exercise protocol that allows for short work intervals at a “hard” intensity with equal amounts of rest, it was hoped that participants could maintain the intensity while still feeling a sense of enjoyment and a confidence in their ability to perform it.

Because there is little current literature around the responses and preferences of Māori women to specific exercise protocols, besides those that align with recommendations of moderate intensity exercise, this study serves to fill the gap in such research. The aim was not to discredit the value of current recommendations, rather to consider and add to the literature suggesting the need for an alternative approach (M. Durie, 2004a; Jung et al., 2015; Jung et al., 2014). By incorporating a culturally appropriate approach that facilitated access to effective exercise, it aimed to bridge the disconnect with groups not currently engaged in activity. By specifically targeting this group of women for the study, using an approach that acknowledged and implemented principles important to Māori, I wanted to contribute to the current public health and exercise physiology literature in a significant way for Māori women.

The findings of this study provide an impetus for an exercise modality, such as F.I.T. Wāhine, being an effective strategy for improving metabolic health in a population at a disproportionate risk of metabolic illness (Ministry of Health, 2016b). By examining the acute physiological response (changes to blood lactate, salivary cortisol, and heart rate response) to a single bout of exercise, we were able to provide comparative information about the potential extent of chronic adaptations to training. Consequently, the findings of this present study indicate the potential for improvements similar to some previously examined HIIT and adapted HIIT or circuit protocols (Fountain & Schmidt, 2015; N. A. Ratamess et al., 2015; Skidmore et al., 2012). This study found that a 20-minute session of F.I.T., comprising 4 rounds of 5 sets of multi-joint exercises

(30-seconds of work interspersed with 30-seconds rest with 10 mins total exercise) performed at an effort level perceived to be around 7 RPE, elicited an acute physiological response acknowledged to result in positive long-term general neuromuscular and cardiovascular adaptations (if performed at the required weekly frequency) (Ozaki et al., 2013). Additionally, although the study did not include a second exercise modality for comparison, it is apparent that participants' positive affective responses and enjoyment measures provide a promising starting point for further research in this area. Additionally, participants were positive in their self-efficacy or confidence in their ability to perform this type of exercise in the future, and positive in their intentions to do so. These measures would have been bolstered by follow-up data on changes to exercise behaviour; however, it must be considered that participants were likely responding in anticipation of continued facilitation of such sessions. As mentioned, although not reported as part of this study, many of the participants continued to attend exercise sessions after their acute testing was completed, and acted as *tuakana* to the newer participants.

It is apparent from these findings that a previously inactive sample of Māori women, from a range of ages, sizes, and backgrounds are able to self-select appropriate intensities with a range of whole-body exercises, with as little as four weeks of progressive familiarisation. By providing a time-efficient and effective exercise alternative to a group of previously inactive women, in a manner that facilitates engagement, acknowledges cultural values, and provides variation, F.I.T. Wāhine is an opportunity to inform further work in similar relevant approaches.

The potential for this type of exercise to be utilised in public health initiatives is promising and with relatively easy implementation in a community setting. Further work examining progressions to work to rest ratios, alongside a comparison exercise modality, such as moderate intensity exercise or traditional aerobic HIIT, could provide support for these preliminary findings. Additionally, research into a longer-term intervention could provide further insight into exercise enjoyment, intentions and future adherence to this exercise modality. Finally, further research could include the examination of regularly active women, to identify other approaches or characteristics that could enhance the appeal and adherence to physical activity initiatives for Māori women.

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Appendices

Appendix A – Ethics Approval



AUTEC Secretariat

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1 June 2016

Isaac Warbrick
Faculty of Health and Environmental Sciences

Dear Isaac

Re Ethics Application: **16/178 Acute physiological and perceptive responses to high intensity interval resistance training with Maori women.**

Short, sharp exercise for Maori women's health (Short title).

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 30 May 2019.

As part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 30 May 2019;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>. This report is to be submitted either when the approval expires on 30 May 2019 or on completion of the project.

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

Kate O'Connor
Executive Secretary
Auckland University of Technology Ethics Committee
Cc: Deborah Heke deborah@aut.ac.nz Nigel Harris

Appendix B. Participant Information Sheet

13 July 2017

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Participant Information Sheet



Date Information Sheet Produced:

1st September 2016

Project Title

Acute physiological and perceptive responses to functional high intensity interval resistance training with Māori women. – F.I.T Wāhine.

Short, sharp exercise for Māori Women – F.I.T Wāhine.

An Invitation

Ko Ngatokimatawhauroa toku waka. Ko Te Ahuahu toku maunga. Ko Omapere toku wai. Ko Ngati Hineira me Uritaniwha oku hapu. Ko Ngapuhi toku iwi. Ko Parawhenua toku marae. Ko Taiaimai toku rohe.

Kia ora, my name is Deborah Heke. I am a Master's student at Auckland University of Technology and REPs registered Personal Trainer. I whakapapa to Ngapuhi through my father Turei Heke – whose work within the community has also inspired my work towards helping people. I have around 5 years of experience as a Personal Trainer – working in gyms and privately. Before that, I worked for over 7 years in various roles in Mental Health Support assisting those living with mental illness. This experience has given me the opportunity to work among a range of people who experience lifestyle related disorders – due to physical inactivity and poor nutrition.

I am undertaking research for my Master's thesis using a 4-week training study with inactive Māori women to try to share the benefits of regular exercise for health, fitness and general holistic well-being. Knowing that Māori are more highly represented among those with preventable lifestyle diseases such as type 2 diabetes – I am motivated as a Māori woman to try to understand the feelings and opinions towards exercise of those Māori women who are not currently active and hopefully provide a more enjoyable and effective exercise option to help wāhine get (and stay) active. My hope is that your participation in this study will not only improve your health and fitness, but also contribute to on-going research that may help Māori women and the wider Māori community to participate in short, sharp exercise for health, fitness and holistic well-being.

By completing this research, I hope to obtain my Masters in Health Science and then pursue further research in this area. I wish to invite you to participate in this study and believe that you will not only be contributing to your own health, but will also be contributing a precious and valued taonga to the on-going kete of knowledge around improving Māori health.

What is the purpose of this research?

To try to understand how inactive Māori women feel towards short, sharp exercise (F.I.T) using principles of kaupapa Māori.

To identify the responses (physiological and perceptive) to F.I.T with wāhine.

To understand how F.I.T influences future exercise behaviour.

To help establish sustainable future exercise behaviour by teaching functional exercise in a high intensity format using principles of kaupapa Māori.

To obtain a Master's degree in Health Science (Deborah Heke) and contribute to research in this area.

How was I identified and why am I being invited to participate in this research?

You have received this information because you responded to an advertisement or referral from any of the following: AUT related print or online media; Hauora, GP clinic; or local marae.

You are eligible for this study if you meet these criteria:

- Māori female between the age of 25 and 55 years.
- Sedentary / Inactive (Less than 150 min/week of self-estimated physical activity/exercise),
- Can safely participate in the prescribed exercise protocol.

Due to safety, if any of the below apply to you, you may be excluded from the study and not be able to participate:

- Your doctor has ever said that you have a heart condition and that you should only perform physical activity recommended by a doctor
- You feel pain in your chest when you perform physical activity
- In the past month, you have had chest pain when you were not performing any physical activity
- You lose your balance because of dizziness or if you ever lose consciousness
- You have a bone or joint problem that could be made worse by a change in your physical activity
- Your doctor is currently prescribing any medication for your blood pressure or for a heart condition
- You know of any other reason why you should not engage in physical activity

We will ask you to complete a Physical Activity Readiness Questionnaire (PAR-Q) and sign a consent form – this will help us identify whether any exclusion criteria apply to you. If you have any doubt, it is recommended that you consult your GP.

What will happen in this research?

This study requires participants to learn some exercises (that use large muscle groups) and use those movements in a "short/sharp" workout designed to be challenging but fun. The workout is called F.I.T or Functional Intense Training, which will combine bodyweight and resistance training with the principles of high intensity interval training.

This 4-week training study (up to 3 days a week) will teach you functional exercises (movements that can translate to fitness outcomes but also everyday life) that will help you complete the designed workout. Initially, group training will include simple movement teaching to ensure you can safely and effectively complete the workout. As you become familiar and confident with the movements, the training will slowly increase in intensity. You will eventually be asked to work at a certain intensity – which is hoped to improve your fitness and other physical outcomes. The workout consists of 4 rounds of 5 different exercises (listed below) which are performed for 30-seconds, with an equal amount of rest/recovery in between each exercise round.

1	SQUAT	Bodyweight (box) squat or lunge /Weighted (box) squat or lunge
2	UPPER BODY PUSH	[Kneeling] Press Up /Hands Elevated Press Up
3	ROPE	Rope slam/waves or similar weighted movement
4	HIP HINGE	Medicine ball clean/pick up/slam
5	UPPER BODY PULL	Inverted row / Resistance band row

In order to access changes to fitness outcomes, participants will be asked to undergo a short fitness test. An aerobic fitness test and muscular strength test will be conducted prior to the 4-week training study and at the completion of the study. These tests will take no longer than 30-minutes.

Because we also want to know what you feel about this training, there will be a few simple questions asked before, during and after each workout. There will also be a questionnaire to complete at the completion of the study. These questions will help us understand how hard the exercise was for you, how much you enjoyed it, and whether you could see yourself performing the exercise in the future. Because this study is based on kaupapa Māori principles, you will also have the opportunity to comment on how this study is conducted; how results are presented and how the training can be sustained in your local community.

At the final training session, we will also measure some acute physiological responses (changes to bodily reactions to one exercise session). You will be asked to provide a small sample of blood and saliva and then perform then workout as usual. After the workout we will take one further finger prick sample and saliva sample to compare any changes. These samples are very small and fairly simple to collect and we will do our best to minimize your discomfort as much as possible.

As part of the follow up, I will also provide an additional workshop session where I will provide practical ways of incorporating this type of exercise into your lifestyle or maintaining the exercise group. We can have some kai and finish off the main part of the study with a chance to share ideas and issues we might have. I will make myself available for questions, queries or ideas about continuing F.I.T in your local communities – either in person, via phone, skype or email.

Finally, approximately 4 weeks later I will contact you to ask you about any changes to your exercise behaviours. This can also be done in person, via phone or skype or email (depending on what is convenient for you).

What are the discomforts and risks?

Blood samples will be taken from a small finger prick.

Salivary samples may feel uncomfortable, as you will be required to “drool” into a sample dish.

High intensity exercise may provide some discomfort, as the nature of it requires intense work. Muscle soreness may be experienced as your body becomes accustomed to new movements.

Because learning and testing stage workouts will be conducted in a group setting there is the potential of embarrassment for participants.

How will these discomforts and risks be alleviated?

Minimal finger pricks will be administered to avoid unnecessary discomfort.

Intensity discomfort will be minimised as the familiarisation stage will be progressive and allow the participant to gradually adapt to movements and exertion. Participants will be given information about how to manage muscle soreness.

Group workouts are designed to be encouraging and motivating, it is predicted that groups will develop a sense of manaakitanga and kinship over the few weeks they are together, this sense of whānau and working together is hoped to combat any potential for embarrassment.

In addition, you are going to be thoroughly supervised and constantly reminded that you can stop or express your discomfort.

Participants should also be aware that participation is completely voluntary and they are free to withdraw from the study at any time before data analysis. Although, the researcher appreciates your participation and commitment to this study, you can decide to remove yourself and your collected data from the study at anytime (prior to data analysis).

What are the benefits?

You as a participant will be offered 4-weeks of closely supervised and monitored exercise instruction (from a Registered Exercise Professional) that has the potential to provide health and fitness benefits and hopefully the motivation to continue a more active lifestyle.

The lead researcher (Deborah) will be given the opportunity to gain her Master's degree in Health Science and very valuable experience in conducting research studies with wāhine Māori.

To the wider community, this research will provide provisional evidence for a potentially effective and enjoyable alternative exercises that may contribute to public health messages to encourage inactive people to engage in alternative exercise.

What compensation is available for injury or negligence?

In the unlikely event of a physical injury as a result of your participation in this study, rehabilitation and compensation for injury by accident may be available from the Accident Compensation Corporation (ACC), providing the incident details satisfy the requirements of the law and the Corporation's regulations.

How will my privacy be protected?

As a participant you can be sure that your name or any reference to you will not be made, once you become a participant you will receive a code so all documents that may be generated will contain this code if the data pertains to you or any other participant. Therefore, it won't be possible to identify you.

Despite this strict control any individual that may interact with you as a participant or your data will sign a confidentiality agreement.

What are the costs of participating in this research?

The study will be at no direct financial cost to yourself but you will be asked to give a small amount of time and energy over the 4-week period, plus a follow-up contact 4-weeks later.

The training study will take place over the course of 4 weeks and you will be required to attend 2-3 sessions per week for up to 60 minutes (a total of 20 minutes of training). Group training will be scheduled at times that are convenient for the majority of the group and researcher.

What opportunity do I have to consider this invitation?

One week from the date of the information hui. At which time, if you decide to participate, you will be asked to sign an informed consent form.

How do I agree to participate in this research?

Sign and return the consent form.

Will I receive feedback on the results of this research?

A summary of this research will be available to participants and will also be presented to whānau, community and local organisations at a later date, if desired. As part of the kaupapa of this study, you will be able to provide feedback about how you might like the results of this work to be shared. It is anticipated that at least one additional publication and/or presentation will result from this study.

What do I have to do to withdraw from this research?

All participation in this research is completely voluntary. If for any reason you decide that you cannot continue with this study and would like to withdraw, you can do so at any time prior to the end of data collection (you will be given a cut-off date closer to the time). All information pertaining to you will also be removed and/or destroyed, if necessary. If you would like any tissue samples (blood slides or saliva samples) returned, please let us know by checking the box on the consent form. Although, I would greatly appreciate your full and committed participation in this study, I also understand that we all have busy lives and families that might require our time. Please do not feel obliged to complete this study if you feel unable to.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Primary Supervisor, *Dr Isaac Warbrick*, Isaac.warbrick@aut.ac.nz or Co-supervisor *Dr Nigel Harris*, nigel.harris@aut.ac.nz.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTC, Kate O'Connor, ethics@aut.ac.nz, 921 9999 ext 6038.

Whom do I contact for further information about this research?***Researcher Contact Details:***

Deborah Heke, debsheke.aut@gmail.com, +64 9 272253 779

Project Supervisor(s) Contact Details:

Dr Isaac Warbrick, isaac.warbrick@aut.ac.nz, +64 9 921 9999 ext 7591

Dr Nigel Harris, nigel.harris@aut.ac.nz, +64 9 921 9999 ext 7301

Thank you again for considering participation in this study.

Nga mihi nui,

Deborah Heke

Approved by the Auckland University of Technology Ethics Committee on 1st June 2016, AUTC Reference number 16/178.

Appendix C – Informed Consent

06 February 2017

page 1 of 2

<h1>Consent Form</h1>	 <p>AUT UNIVERSITY <small>TE WĀNANGA ARONUI O TAMAKI MAKAU RAU</small></p>
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Project title: Short, sharp exercise for Maori Women's Health

Project Supervisors: **Dr Isaac Warbrick, Dr. Nigel Harris**

Researcher: **Deborah Heke**

- ☐ I have read and understood the information provided about this research project in the Information Sheet dated 01 September 2016.
- ☐ I have had an opportunity to ask questions and to have them answered.
- ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ☐ I am not suffering or have history any disease, condition or characteristic that it is stated in the exclusion criteria of the information sheet that I have read and if anything of this arises during the time that the study takes place I agree to immediately inform the primary researcher or the supervisor of this study.
- ☐ I agree to provide blood and/or salivary samples and undertake all assessments that are stated in the information sheet that I read and fully understand their purposes.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a copy of the report from the research (please tick one): Yes ☐ No ☐
- ☐ I wish to have blood samples returned to me: Yes ☐ No ☐

Participant's signature:

Participant's name:

Participant's Contact Details (if appropriate):

.....

Date:

Approved by the Auckland University of Technology Ethics Committee on 1st June 2016 AUTEC Reference number 16/178

Note: The Participant should retain a copy of this form.

F.I.T WĀHINE - EXERCISE STUDY VOLUNTEERS NEEDED



Are you wanting to get active but don't know where to start?

This 4-week training study aims to understand different responses to short, sharp exercise with inactive Māori women. I am looking for volunteers to participate for 2-3 training sessions a week for 4 weeks. In this time, you will be taught useful exercises in a fun group workout designed to get you fitter, healthier and more active. This study will include kaupapa Māori principles so you will have a say in how this study is conducted and what happens with it once the study is completed.

If you fit the criteria below and are keen to hear more about this study, please feel free to contact me. I will be holding an information hui in the coming weeks so I welcome you to bring your whānau along to hear more about what I want to achieve and how you might be able to help.

Please contact me if you:

- **Female and self-identify as Māori**
- **Do not currently achieve physical activity guidelines (about 30 minutes of moderate exercise 5 times a week)**

If you do not fit these criteria, you have a serious health condition that might exclude you from being able to participate, or you do not think you have the time to participate, I still welcome you to come along to meet with us and hear about the study at a local hui I will be running. Please contact me if you are interested in hearing more about this study.

Deborah Heke
027 2253 779
debsheke.aut@gmail.com

Appendix E – Physical Activity Readiness Questionnaire

F.I.T WĀHINE

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE

NAME		ID	
DATE		AGE	
HEIGHT		WEIGHT	
GP NAME		GP CONTACT #	

	QUESTIONS	YES	NO
1	Has your doctor ever said that you have a heart condition and that you should only perform physical activity recommended by a doctor?		
2	Do you feel chest pain when you perform physical activity?		
3	In the past month, have you had chest pain when you were not performing any physical activity?		
4	Do you lose your balance because of dizziness or do you ever lose consciousness?		
5	Do you have a bone or joint problem that could be made worse by a change in your physical activity?		
6	Is your doctor currently prescribing any medication for your blood pressure or heart condition?		
7	Do you know of any other reason why you should not engage in physical activity?		

If you have answered "Yes" to one or more of the above questions, consult your GP before engaging in any physical activity. After a medical evaluation, seek advice from your GP on what type of activity is suitable for your current condition.

I acknowledge that the information provided above regarding my health and personal information is, to the best of my knowledge, correct. I will inform the primary researcher immediately if there are any changes in my health status. I understand that participating in physical activity and exercise can carry a risk, and I accept all responsibility for that risk. I understand that due care will be undertaken by the primary researcher at all times.

NAME: _____

SIGNATURE: _____

DATE: ____ / ____ / ____

Appendix F – Physical Activity Enjoyment Scale and Perceptive Questionnaire

Affective Response Questionnaire

ID: _____

Date: _____

Time: _____

Task Self-efficacy

These questions will help identify your confidence in your ability to perform this exercise in the future.

There are 5 items below. Please answer each and score the below items on a scale of 0% (Not at all) to 100% (Extremely confident). Please circle your response.

1) “How confident are you that you can perform one bout of exercise a week for the next 4 weeks that is just like the one you completed today?”

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

2) “Perform two bouts of exercise a week for the next 4 weeks that is just like the one you completed today?”

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3) “Perform three bouts of exercise a week for the next 4 weeks that is just like the one you completed today?”

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

4) “Perform four bouts of exercise a week for the next 4 weeks that is just like the one you completed today?”

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5) “Perform five bouts of exercise a week for the next 4 weeks that is just like the one you completed today?”

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Intentions

This section assesses your intentions to engage in the exercise over the next month please answer the 3 items below. Please rate the extent to which you agree with the following statements. Engaging in this type of exercise includes: attending future workouts and/or other vigorous intensity workouts.

1) I intend to engage in the type of exercise I performed today at least once per week during the next month

1	2	3	4	5	6	7
Very unlikely			Neutral			Very Likely

2) I intend to engage in the type of exercise I performed today at least twice per week during the next month

1	2	3	4	5	6	7
Very unlikely			Neutral			Very Likely

3) I intend to engage in the type of exercise I performed today at least three times per week during the next month

1	2	3	4	5	6	7
Very unlikely			Neutral			Very Likely

Enjoyment

Your enjoyment of the exercise protocol will be examined using a modified version of the Physical Activity Enjoyment Scale (PACES).

Think about the exercise you did today and rate your enjoyment of it

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

I enjoyed it I hated it

1	2	3	4	5	6	7
---	---	---	---	---	---	---

I felt bored I felt interested

1	2	3	4	5	6	7
---	---	---	---	---	---	---

I disliked it I liked it

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

I found it pleasurable I found it unpleasurable

1	2	3	4	5	6	7
---	---	---	---	---	---	---

It's no fun at all It's a lot of fun

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

I found it energizing

I found it tiring

1	2	3	4	5	6	7
---	---	---	---	---	---	---

It makes me depressed

It makes me happy

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

It's very pleasant

It's very unpleasant

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

I feel good physically
while I do itI feel bad physically
while doing it

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

It's very invigorating

It's not at all invigorating

1	2	3	4	5	6	7
---	---	---	---	---	---	---

I was frustrated by it

I was not at all
frustrated by it

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

It's very gratifying

It's not at all gratifying

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

It's very exhilarating

It's not at all exhilarating

1	2	3	4	5	6	7
---	---	---	---	---	---	---

It's not at all stimulating

It's very stimulating

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

It gives me a strong
sense of
accomplishmentIt does not give me
any sense of
accomplishment

*	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

It's very refreshing

It's not at all refreshing

1	2	3	4	5	6	7
---	---	---	---	---	---	---

I felt as though I
would rather be
doing somethingI felt as though
there was nothing
else I would rather
be doing

Information about the intervention

The following questions will identify how enjoyable you found certain aspects of this study
Please rate the following on a scale from 1 (Not enjoyable at all) to 7 (Very enjoyable).

The specific workout design (exercises / timing)

1	2	3	4	5	6	7
Not enjoyable at all						Very Enjoyable

The group environment of the workout

1	2	3	4	5	6	7
Not enjoyable at all						Very Enjoyable

The approach taken to the exercise study or the vibe (inclusion of Maori principles of manaakitanga, whanaungatanga, rangatiratanga). Sharing, having a say in aspects of the workout, delivery etc.

1	2	3	4	5	6	7
Not enjoyable at all						Very Enjoyable

Working out with a group of wāhine at a similar activity level to yourself

1	2	3	4	5	6	7
Not enjoyable at all						Very Enjoyable

The location of the workouts (MPHS Hubwest Community Centre)

1	2	3	4	5	6	7
Not enjoyable at all						Very Enjoyable

Thank you again for your time and energy completing the exercise and this questionnaire. If you have any final comments, please feel free to use the space below. Please include any suggestions about how to make this type of workout more enjoyable, whether you would like to continue participating in the workouts and any other ideas.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.