Technology in Youth Physical Activity Study

Report

Executive Summary

Executive summary – context & approach

This study aims to create a foundation of knowledge to assess the implications and impact of technology on rangatahi (aged 12-18) both overall and in priority segments (Girls, High Deprivation, Maori/Asian/Pasifika, Youth, Disabled People). This is in the context of both low physical activity (PA) rates, and the high relevance of digital technologies for rangatahi.

The two objectives of the study are:

1. Identify technology that is being used by rangatahi across different segments through desktop assessment and evaluation.
2. Define the potential implications of these emerging technologies on physical activity for less active rangatahi in New Zealand.

Specifically, the study aims to establish a global perspective on:

1. A framework and theory of change to establish the relationship between technology and physical activity;
2. The drivers of, and barriers to, physical activity for rangatahi;
3. The technology mechanisms that may influence these barriers and drivers;
4. Specific examples of technologies that may be used to influence physical activity in rangatahi;
5. Considerations and implications for Sport NZ and partners to effectively engage with technology for rangatahi physical activity.

Sport NZ engaged Portas Consulting to conduct this study. Portas undertook stakeholder and expert interviews across the ecosystem, and leveraged various academic, industry and in-house tools and databases to systematically define and explore the technology landscape for global youth physical activity.

Executive summary – findings

The impact of technology on physical activity participation of rangatahi and priority segments

Mechanisms

9 main technology mechanisms that activate physical activity drivers

- Gamification, personalization, socialization and intensification show greatest alignment with drivers of physical activity
- Democratisation may break down barriers specific to disabled people and high deprivation communities
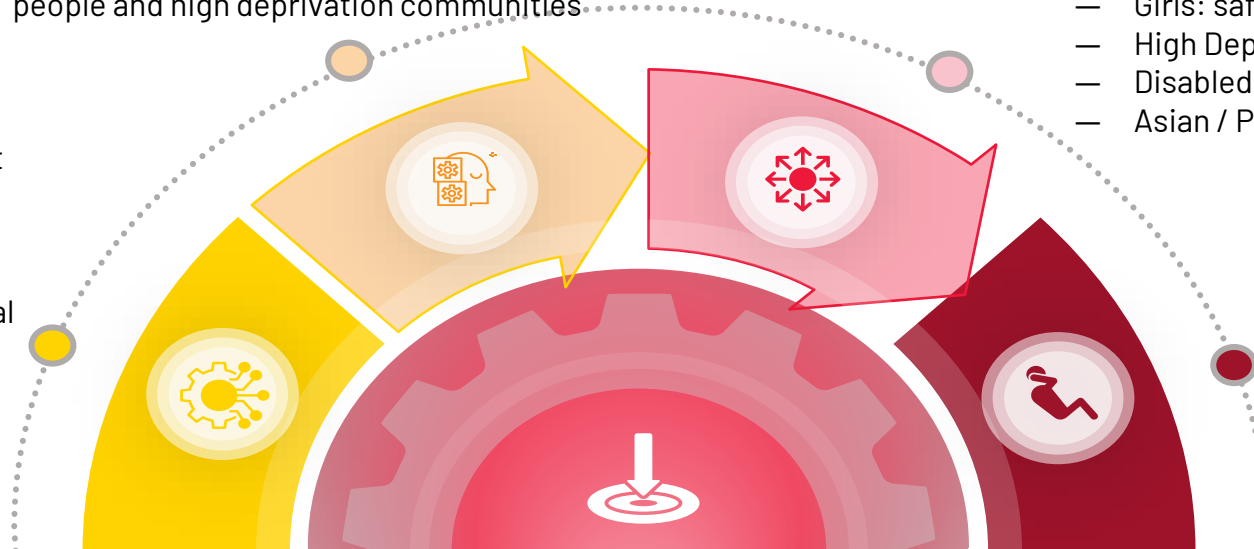
Drivers

11 categories of drivers for physical activity to target with technology

- Biggest motivators are health, enjoyment and social encouragement, biggest barriers are lack of time, motivation and energy. Additional drivers for priority segments:
  - Girls: safety, over-competition and social norms
  - High Deprivation: lack of access and affordability
  - Disabled people: lack of access and cost
  - Asian / Pasifika: cultural expectations for activity

Technology

12 mainstream technology use cases, with most activating multiple mechanisms
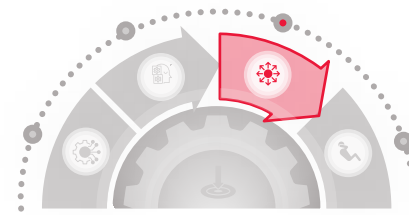
- 8 of these show the greatest alignment with the mechanisms that best align to physical activity drivers: Active esports, virtual sports, education and training apps, social fitness apps, social media, fitness blockchain, smart equipment and fitness trackers
- 4 of these show the best potential for high deprivation and disabled people: Education and training apps, fitness aggregator apps, infrastructure and assistive technology

Physical Activity

- **46% of rangatahi currently meet physical activity guidelines (2022).**

There is an opportunity to increase physical activity in priority rangatahi using technology

Executive summary – drivers of physical activity

- There are **11 categories of drivers of physical activity in 3 groups (personal, social, environmental)** including motivations and barriers that affect different demographic segments in different ways. Groupings are aligned to the Sport NZ socioecological model for behaviour change.

- Among rangatahi, the biggest motivators of activities are **health, enjoyment, and social encouragement**, while **lack of time, motivation, and energy** are the top barriers for participation.

- For priority groups, there are barriers that are particularly important:

  — Girls: **Safety, over-competition, and social norms**

  — High deprivation: **Lack of access and affordability**

  — Disabled people: **Lack of access due to transport, cost of specialised equipment / facilities, lack of specialised coaching**

  — Asian / Pasifika: **Cultural expectations (academics / family)**

- By **identifying these drivers, we can then assess the various technology mechanisms and use cases** vis-à-vis their relative impact on the drivers most relevant to rangatahi and the priority groups
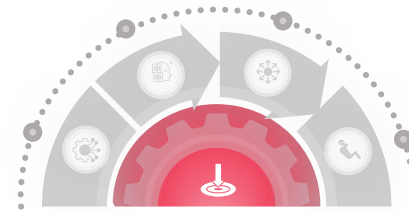
Executive summary – technology mechanisms

- There are **9 main technology mechanisms** that impact physical activity drivers: gamification, socialisation, personalisation, intensification and democratisation of; knowledge, access, affordability, ability and time.

- In particular, **gamification, personalisation, socialisation and intensification** show the greatest alignment with drivers of physical activity for rangatahi (enjoyment & interest, and socialisation).

- **Democratisation (e.g., of time, access, and cost)** is a major mechanism of many technologies, and can potentially significantly impact barriers to physical activity that are **most prevalent in priority populations such as lack of time, access, and affordability**

- **Emerging technologies leverage one or more of these technology mechanisms** to influence behaviour, and individual technology use cases can be identified and assessed based on their specific mechanisms and the associated impact on drivers of physical activity.

- However, **research in this area is limited globally**, and therefore a hypothesis-driven 'theory of change' model can help to establish the link between a specific technology use case for rangatahi, the technology mechanism, the drivers of activity and then actual behaviour change.

Executive summary – technology use cases

- **We identified 12 mainstream technology use cases** across esports, apps, web content, and hardware that appear to have the highest impact on the 9 mechanisms impacting physical activity behaviour.

- **Many technology use cases activate multiple mechanisms simultaneously.** The most common mechanisms that are activated are gamification, democratisation of knowledge and democratisation of access.

  — **8 technologies show the greatest alignment with the mechanisms that impact physical activity drivers for rangatahi**: Active esports, virtual sports, education and training apps, social fitness apps, social media, fitness blockchain, smart equipment and fitness trackers

  — **4 technologies show the best alignment with democratisation mechanisms for high deprivation groups and disabled people** : Education and training apps, fitness aggregator apps, infrastructure and assistive technology.

  — While some technology use cases directly target physical activity, those with the highest potential tend to **leverage multiple mechanisms to influence behaviour,** with physical activity is only one outcome (e.g., social media influencers)

- When adding the lens of **adoption and accessibility**, social media and apps emerge as the technologies with high potential for priority segments as they have the highest current penetration and market maturity.

- Active esports, virtual sports, smart infrastructure and equipment, could have **high growth potential** given they are currently low on the technology maturity curve.

Executive summary – implications and next steps

- Initial research and theory of change analysis suggests that there is **significant potential for technology to positively influence rangatahi physical activity particularly for priority groups** (e.g., girls, disabled people, high deprivation groups) by targeting most relevant drivers

- However, there are several considerations that need to be taken into account in choosing the appropriate strategy for Sport NZ:
  - There is a need to **fully understand the local context** of the interaction between rangatahi and technology to ensure any strategies are fit-for-purpose, locally applicable and culturally appropriate
  - Any implementation strategy must consider in advance, **specific rangatahi context and risks**, such as addiction, mental health, information quality and privacy
  - The speed of technological advancement is exponential, and therefore any strategy needs to **build in flexibility, adaptability and robust monitoring and evaluation** to ensure the desired outcomes are achieved and maintained for future generations

- Furthermore, there are additional considerations for Sport NZ in leveraging technology solutions:
  - The **potential to integrate technology into and alongside Sport NZ's current existing activities and interventions** (e.g., Active As, Hawaiki Hou)
  - The **role of Sport NZ** (e.g., funding, facilitator, owner-operator etc.) **throughout whole-system** (from policy to the individual) to best foster long-term physical activity habits in rangatahi
  - **Effectiveness** in the delivery of technology-based interventions will **depend significantly on the design of the intervention to promote long-term uptake amongst rangatahi**

- **In terms of next steps**, we would recommend conducting primary research to establishing a base of knowledge specific to rangatahi in New Zealand (to build on and test existing global research, which is not specific to NZ context), ahead of developing a clear strategy and implementation plan aligning with wider Sport NZ policy and leveraging international best practices

Main Report

CONTEXT

While there are global differences, on average only 19% of youth meet physical activity guidelines

SPORT
NEW ZEALAND
IHI AOTEAROA

USA

Boys	36%
Girls	19%

France

Boys	18%
Girls	8%

China

Boys	20%
Girls	11%

Brazil

Boys	22%
Girls	11%

Egypt

Boys	18%
Girls	7%

Australia

Boys	13%
Girls	9%

Global average

19% of youth are physically active

WHO physical activity guidelines for children/youth aged between 5-17 are an average of 60 minutes a day, or 7 hours a week.
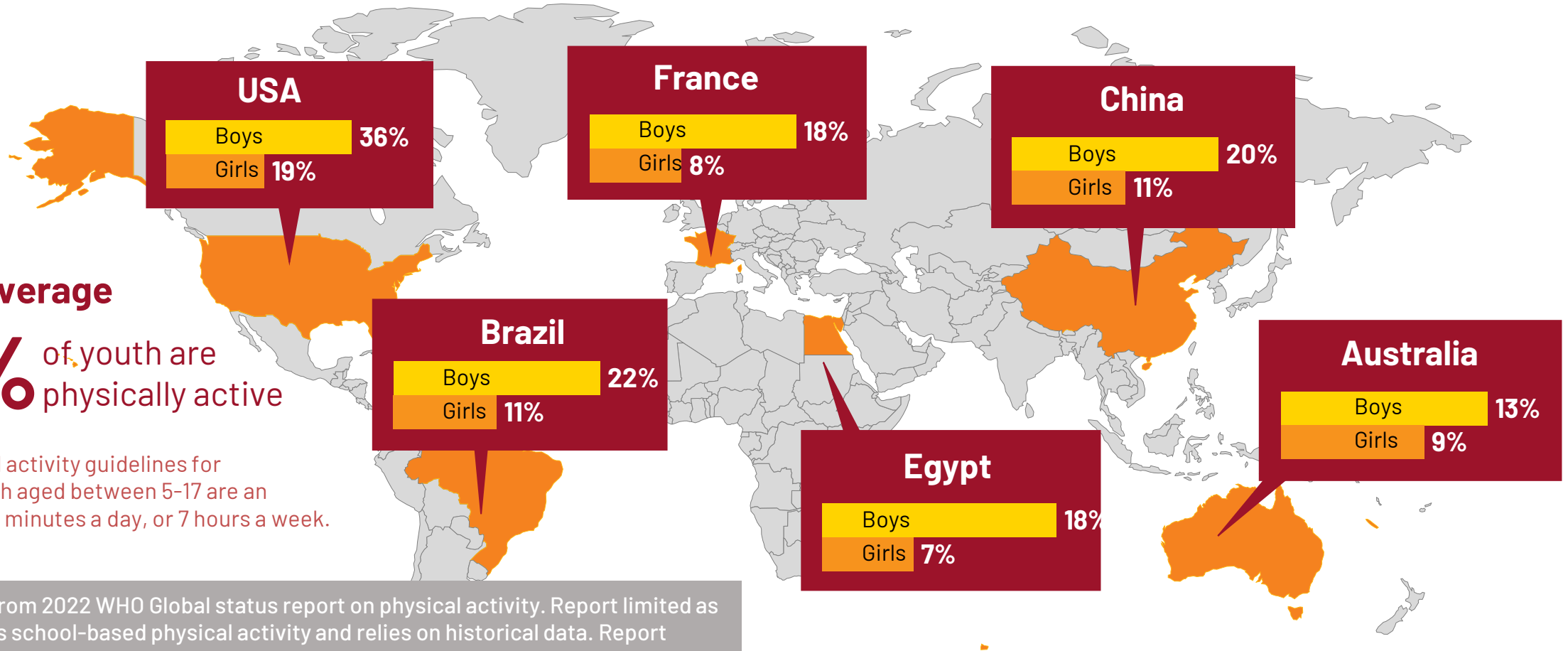
Data taken from 2022 WHO Global status report on physical activity. Report limited as only includes school-based physical activity and relies on historical data. Report selected, however, to allow for cross-country comparison.

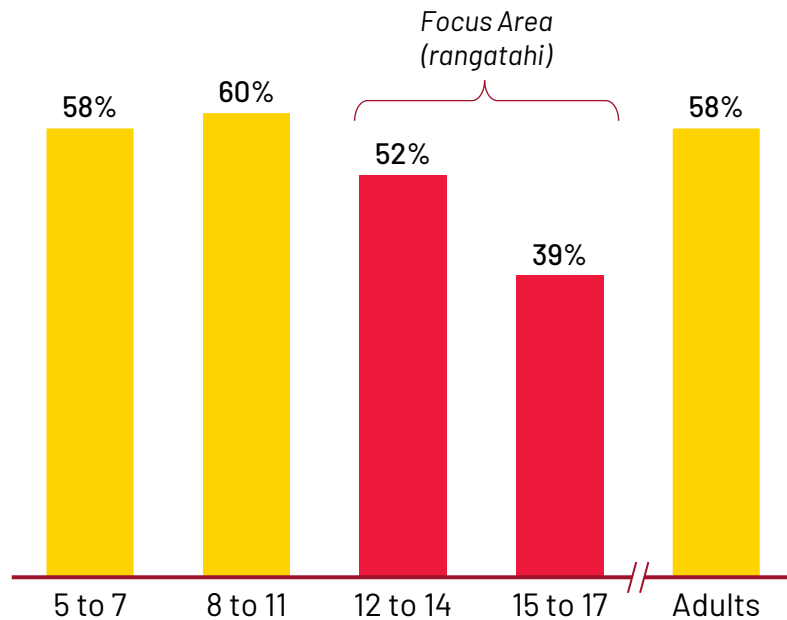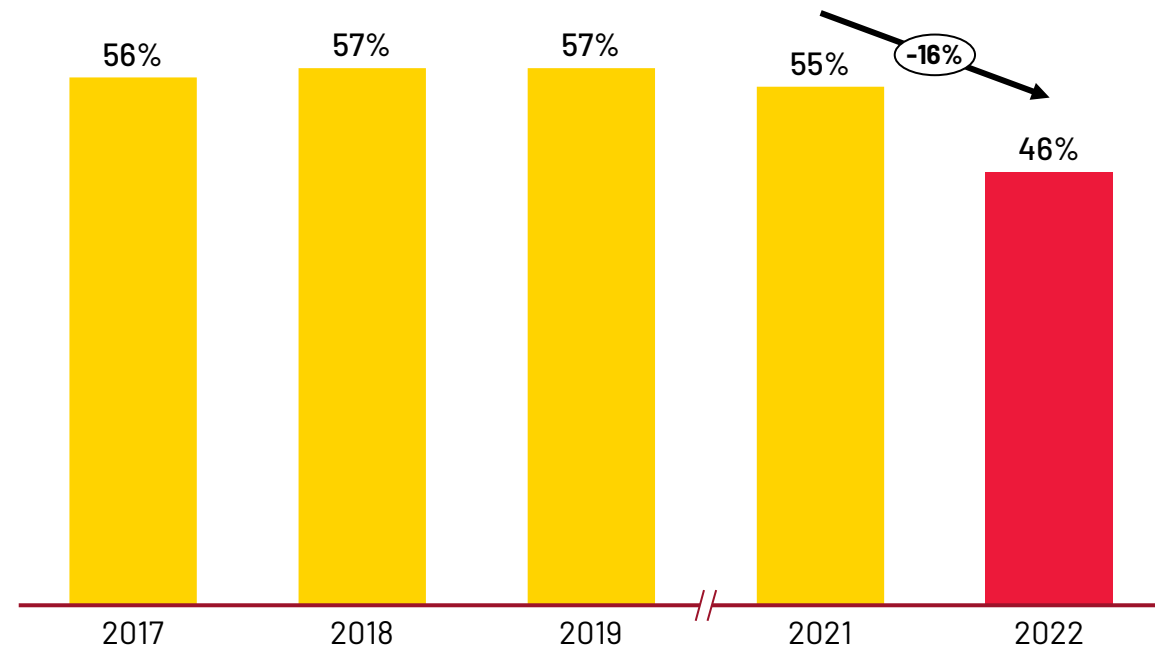# In New Zealand, rangatahi are the least active group and activity levels appear to be falling

SPORT
NEW ZEALAND
IHI AOTEAROA

Participation in New Zealand

WHO physical activity guidelines for children/youth aged between 5-17 are an average of 60 minutes a day, or 7 hours a week.

Proportion of overall population that meet physical activity guidelines (2022)

Changes in proportion of rangatahi that meet physical activity guidelines between 2017-2022

Focus Area (rangatahi)

5 to 7	8 to 11	12 to 14	15 to 17	Adults
58%	60%	52%	39%	58%

-16%

2017	2018	2019	2021	2022
56%	57%	57%	55%	46%

Comparison with data on previous page not made due to methodological differences in data collection. N.B. 2022 WHO Global status report on physical activity, reports that physical activity levels for New Zealand Youth (11-17yrs) are 15% for boys and 7% for girls

Source: Sport NZ, WHO (2022), Portas analysis

Girls, Pacific & Asian, Persons with Disability and High Dep populations are also less active

Proportion of rangatahi subgroup that meet physical activity guidelines (2022)

By gender

- Male — 51%
- Female — 41%

By disability

- Non-Disabled — 50%
- Disabled — 42%

Disabled people defined by people who self-report at least some difficulty across one or more of 6 domains of disability

By deprivation

- Low Deprivation (1-3) — 58%
- Medium Deprivation (4-7) — 52%
- High Deprivation (8-10) — 48%

Based on the NZDep index of socioeconomic deprivation. A value of 10 indicates the most deprived 10 percent of areas in New Zealand
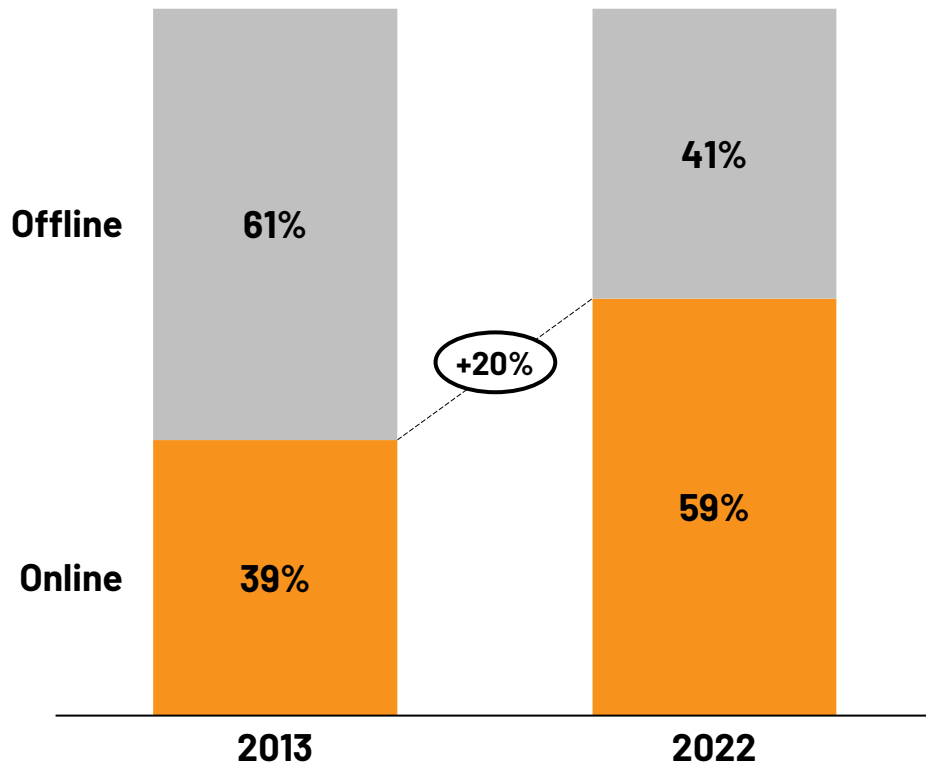
By ethnicity

- European — 57%
- Maori — 55%
- Pacific — 48%
- Asian — 43%

Ethnicity based on self-identification

Digital technology has fundamentally changed the way youth interact with the world

Changes in youth behaviour

% of 'leisure or recreational activity' time spent youth 12-17

Offline
- 2013: 61%
- 2022: 41%

Online
- 2013: 39%
- 2022: 59%

+20%

2013   **2022**

Usage of digital platforms in youth

% of 16-18 y.o. with daily time spent ≥ 1 hour by digital mediums (2023)
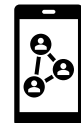
Mobile devices
87%

PCs / Laptop / Tablets
58%

Social Media
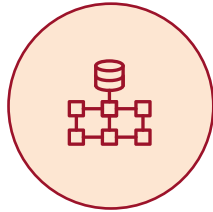61%

Music Streaming Services
46%

This extensive technology engagement in youth is shaping expectations of service providers...

FROM

TO

Structured & scheduled

Fixed time for appointments , meetings and services
Hierarchical relationships and expectations

On Demand

Services I want are available to me where and when I want to access them

Institutionalised

Formal institutions and organisations are brokers and owners of access to standardised knowledge and information

Democratised

Access to content, knowledge and information is free and easily available, and increasingly specific to me and my individual needs

Single-channel

Services are a point in time and accessed through a fixed method or medium
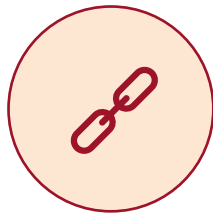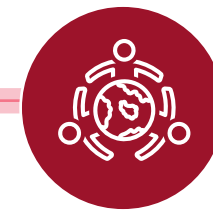
Multi-channel

Services are available widely, in different mediums that suit my individual needs

...including expectations related to physical activity

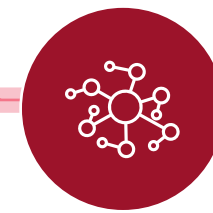|	Definition	Potential implications on physical activity
On-Demand	Services I want are available to me where and when I want to access them	▪ Fixed schedules and training approaches do not meet youth expectations, providing real-time personalised feedback on physical activity (e.g., Apple Watch) can drive direct engagement ▪ Tailored workout routines for the individual at their own time and places (e.g., Fitbod)
Democratised	Access to content, knowledge and information is free and easily available, and increasingly specific to me and my individual needs	▪ Universal access to free fitness information (e.g., TikTok tutorials) ▪ Physical activity communities through social platforms (e.g., Reddit r/fitness) ▪ Innovation driving down the cost of physical activity equipment and apparel (e.g., Xiaomi Mi Band)
Multi-Channel	Services are available widely, in different mediums that suit my individual needs	▪ Youth can pick and choose where and how they engage, and will often use more than one channel to access information, content or services. ▪ Automation reducing cost by enabling unmanned facilities and new modes of engagement for different audiences (e.g., The Gym Pod) and creating new places to engage and access

While technology may have a positive impact on activity, currently evidence is anecdotal & limited

Challenges in current evidence on technology and physical activity relationship

Anecdotal evidence

- Typically, success stories or use cases are based on personal testimonials and experience

- There is a lack of systematic research with clear conclusions

- Anecdotally driven evidence may be influenced by cognitive biases

Limited understanding on the role of technology

- Absence of a clearly defined cause-and-effect relationship, or theory of change, between technology and physical activity

- No consistent mechanism explaining how technology influences behaviour, making it difficult to design and test targeted solutions

Lack of localisation

- Research and studies typically conducted on general populations, lacking targeted research on priority inactive groups

- Research often lacks longitudinal rigour and consideration of implementability within local context e.g., technology access & cost

This study aims to create a foundation to systematically analyse the impact of technology

Problem statement

Understand how rangatahi (aged 12-18 years) in New Zealand are currently using digital technologies to engage in physical activity and identify opportunities for Sport NZ to leverage technology to increase participation in less active rangatahi
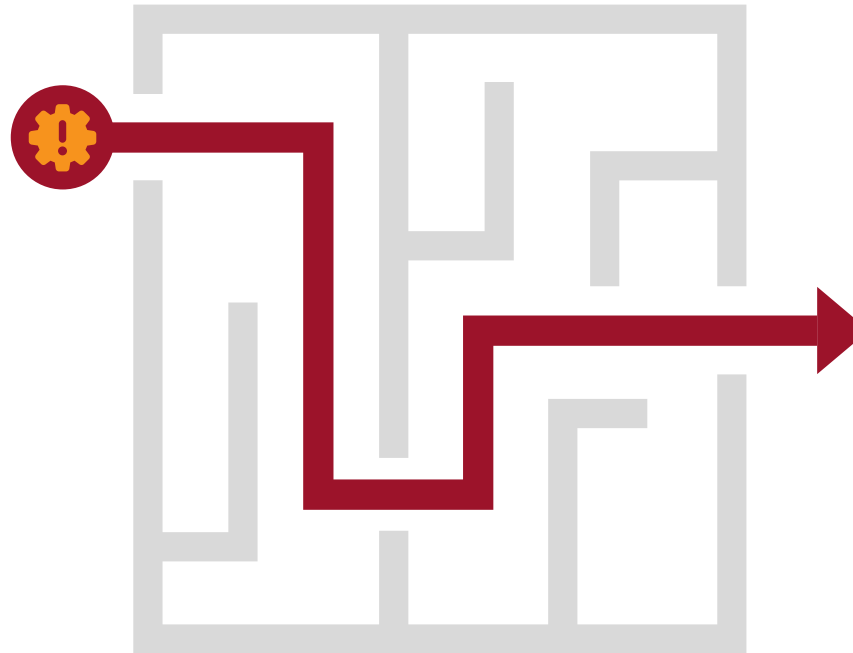
Analyses to address problem statement

01 A framework and theory of change to establish the relationship between technology and physical activity;

02 The drivers of, and barriers to, physical activity for rangatahi;

03 The technology mechanisms that may influence these barriers and drivers;

04 Specific examples of technologies that may be used to influence physical activity in rangatahi;

05 Considerations and implications for Sport NZ to effectively engage with technology for rangatahi physical activity.

Technology impacts physical activity through mechanisms and drivers

Theory of change: How technology impacts physical activity participation

Mechanisms

Functions of technology impacting physical activity drivers (e.g., gamification, socialisation etc.)

Mechanisms of technology could be leveraged to impact an individual's motivations and barriers for physical activity

Drivers

Factors influencing participation (motivations and barriers)

Individual uses technology for different functional reasons

Physical activity drivers inform an individual's physical activity behaviour

Technology

Specific digital technology used by youths (e.g., wearables, esports etc.)

Physical Activity

Physical activity behaviour (active/inactive)

Establishing a clear theory of change from technology use case through to physical activity provides a framework through which Sport NZ can identify and evaluate the highest impact interventions on your target demographics.

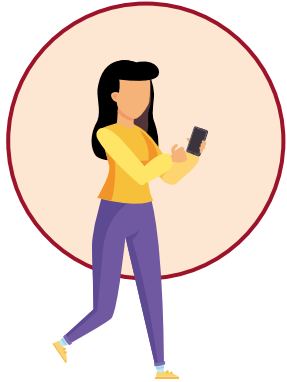# Examples of technology mechanisms impacting physical activity drivers

Illustrative worked examples

Example 1

Technology

Holda is a 14-year-old physically inactive female. She recently started using Facebook to find potential social activities around her home

Mechanism

Through Facebook's socialisation features, she discovered a local women's football group

Drivers

This allowed her to break down her barrier to physical activity which was the lack of friends who shared the interest to play

Physical Activity

The socialisation mechanism of social media lowered her barrier to participation, enabling her to become active

Example 2

Technology

Aleki is a 17-year-old physically inactive male from a high deprivation area. A 24-hour unmanned gym enabled through automation recently opened near his home.

Mechanism

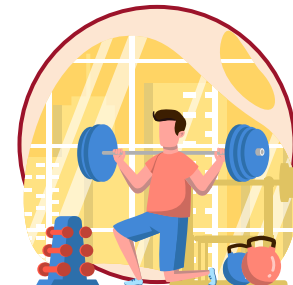The gym's operation around the clock facilitated the democratisation of time for exercise

Drivers

Aleki's family commitments during the day were his main barrier to physical activity. He is now able to gym at late hours when he has no family commitments

Physical Activity

The democratisation of time mechanism of the unmanned gym lowered his barrier to participation, enabling him to become active

FINDINGS

Executive summary – findings

The impact of technology on physical activity participation of rangatahi and priority segments

Technology

12 mainstream technology use cases, with most activating multiple mechanisms

- 8 of these show the greatest alignment with the mechanisms that best align to physical activity drivers: Active esports, virtual sports, education and training apps, social fitness apps, social media, fitness blockchain, smart equipment and fitness trackers

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Mechanisms

9 main technology mechanisms that activate physical activity drivers

- Gamification, personalization, socialization and intensification show greatest alignment with drivers of physical activity

- Democratisation may break down barriers specific to disabled people and high deprivation communities

Drivers

11 categories of drivers for physical activity to target with technology

- Biggest motivators are health, enjoyment and social encouragement, biggest barriers are lack of time, motivation and energy. Additional drivers for priority segments:
  - Girls: safety, over-competition and social norms
  - High Deprivation: lack of access and affordability
  - Disabled people: lack of access and cost
  - Asian / Pasifika: cultural expectations for

Physical Activity

- **46% of rangatahi currently meet physical activity guidelines (2022).**

There is an opportunity to increase physical activity in priority rangatahi using technology

Drivers

Executive summary – drivers of physical activity

- There are **11 categories of drivers of physical activity in 3 groups (personal, social, environmental)** including motivations and barriers that affect different demographic segments in different ways. Groupings are aligned to the socioecological model for behaviour change.

- Among rangatahi, the biggest motivators of activities are **health, enjoyment, and social encouragement**, while **lack of time, motivation, and energy** are the top barriers for participation.

- For priority groups, there are barriers that are particularly important:

  — Girls: **Safety, over-competition, and social norms**

  — High deprivation: **Lack of access and affordability**

  — Disabled people: **Lack of access due to transport, cost of specialised equipment / facilities, lack of specialised coaching**

  — Asian / Pasifika: **Cultural expectations (academics / family)**

- By identifying these drivers, we can assess the various technology mechanisms and use cases vis-à-vis their relative impact on the drivers most relevant to rangatahi and the priority groups

Physical activity drivers include a broad range of motivations...

Motivations to Physical Activity
Adapted from motivations and barriers from Sport NZ and other global best practices

Personal			
	Enjoyment / interest / motivation	Physical activity is enjoyable because...	I like the sport
			I like being active
			I have fun
			I'm good at it
			I like to win
	Personal development	Physical activity helps my personal development because...	I develop life skills
			I develop sport skills
			I can prepare for event/competition
			I can become a professional athlete
			I can be more like my role model
	Health /ability	Physical activity improves my personal health because...	It improves my physical health
			It helps me lose weight
			It improves my mental health / destress
			It helps me recover from injuries

Personal			
	Time	I have time to do physical activity because...	I have access to school facilities
			I have convenient access to facilities
Social	Social activity	Physical activity improves my social life because...	I can meet new people
			I can do activity with friends
			I can do activity with family
			I can fit in with social circle
	Social encouragement & norms	I am influenced to do physical activity because...	My friends who are active / want me to
			My family who are active / want me to
			It is in my school physical activity curriculum

…and barriers

Barriers to physical activity

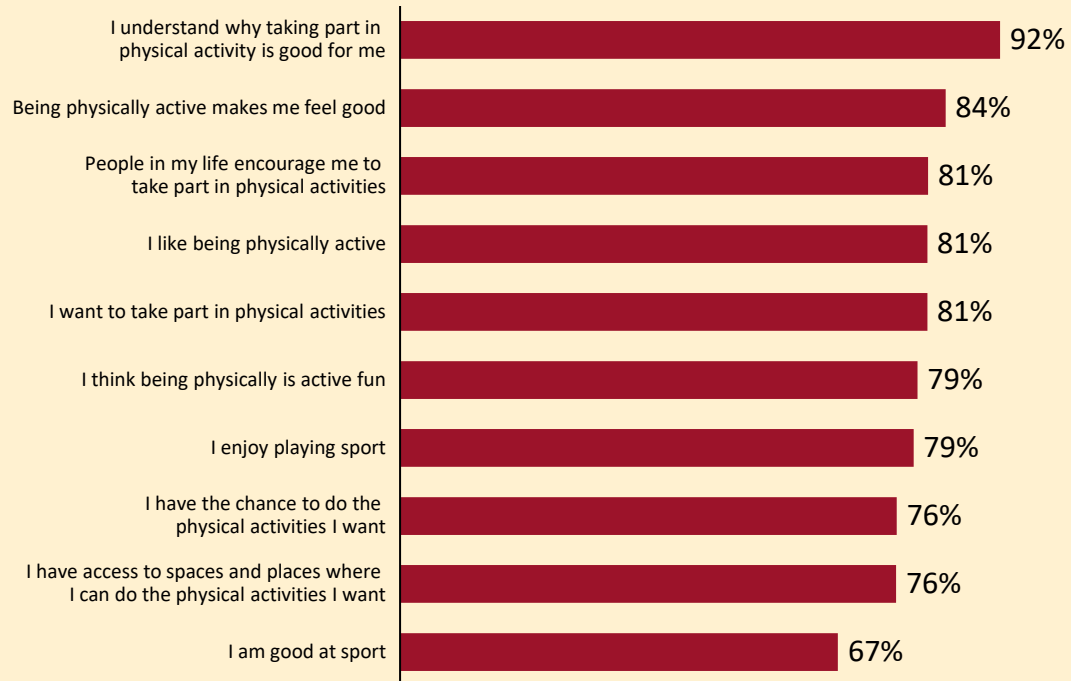Adapted from motivations and barriers from Sport NZ and other global best practice

Personal	Cost	I cannot afford physical activity because…	Accessing the facility is too expensive
			Transport to the facility is too expensive
			Programmes or coaching are too expensive
			Equipment and apparel is too expensive
	Time	I don't have time to participate in physical activity because…	I am too busy with school commitments
			I am too busy with family commitments
			Physical activity is low on my priorities
	Enjoyment / interest / motivation	I am not motivated to participate in physical activity because…	I am not interested
			I prefer other things / activities
			I lack confidence to participate
			I don't want to fail
			Physical activity is not fun
			Sport is not fun
	Knowledge / awareness	I don't know how to participate in physical activity because…	There are no coaches for my sport
			I don't like my coach
			I can't find information online
			Coaches are fully booked

Personal	Health / ability	My personal health does not allow me to participate in physical activity because…	I have a physical disability
			My mental health is poor
			I have a physical injury
			I lack the energy to participate
			I am not fit enough to participate
Social	Social encouragement & norms	I am not encouraged to participate in sport because	My parents aren't active
			My parents don't want me to participate
			My friends aren't active
			My friends don't want me to participate
	Social activity	I don't have anyone to play with because…	I have no friends or family interested in playing
			My friends or family are not free at the same time
			I don't have a way to meet up with friends
Environmental	Facilities / infrastructure	I cannot access my facility because…	It is too far away
			It is inconvenient via transport
			It is fully booked
			There is no facility for my preferred sport
	Weather/safety	My environment does not allow me to participate because….	There is bad weather
			I don't feel safe

NZ youth are most motivated by benefits of physical activity, but are too busy to participate more

Top 10 motivators

Proportion of active rangatahi who indicate that they are motivated by the factor to participate in physical activity

Factor	%
I understand why taking part in physical activity is good for me	92%
Being physically active makes me feel good	84%
People in my life encourage me to take part in physical activities	81%
I like being physically active	81%
I want to take part in physical activities	81%
I think being physically is active fun	79%
I enjoy playing sport	79%
I have the chance to do the physical activities I want	76%
I have access to spaces and places where I can do the physical activities I want	76%
I am good at sport	67%

Top 10 barriers (for individuals who want to do more)

Proportion of inactive rangatahi who indicate the factor as a barrier to doing more physical activity

Factor	%
Too busy	37%
It's too hard to motivate myself	28%
I'm too tired / don't have the energy	25%
I prefer to do other things	20%
I have no one to do it with	15%
I'm not confident enough	15%
The weather	14%
I'm not fit enough	13%
I don't like other people seeing me being physically active	10%
Not enough PE offered at school	10%
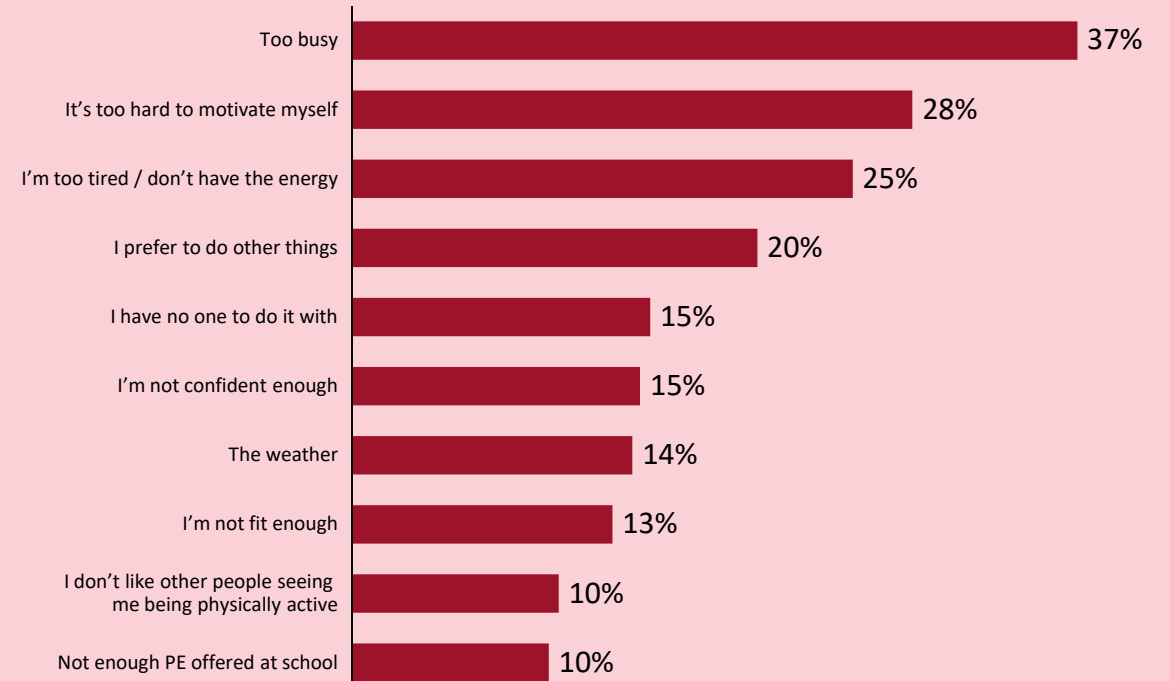
While priority segments have similar overall trends, some barriers are more prevalent in specific groups

Proportion of inactive youth subgroups that indicate the following as barriers to their PA

Girls

Top 3 barriers for female rangatahi youths who want to do more physical activity

- 35% — I prefer to do other things
- 30% — Too busy
- 24% — I'm too tired / don't have the energy

Disabled

Top 3 barriers for disabled rangatahi youths who want to do more physical activity

- 34% — I prefer to do other things
- 28% — Too busy
- 24% — I'm too tired / don't have the energy

High deprivation

Top 3 barriers for high deprivation rangatahi youths who want to do more physical activity

- 30% — Too busy
- 26% — It's too hard to motivate myself
- 23% — I'm too tired / don't have the energy

Asian/Māori/Pasifika

Top 3 barriers for Asian, Māori and Pacific youth who want to do more physical activity

Legend: Maori, Pacific Peoples, Asian

Too busy
- Maori 28%
- Pacific Peoples 16%
- Asian 34%

I prefer to do other things
- Maori 22%
- Pacific Peoples 24%
- Asian 27%

It's too hard to motivate myself
- Maori 16%
- Pacific Peoples 14%
- Asian 21%

Stakeholder consultations have also revealed additional challenges for priority segments

Specific barriers for priority segments

Girls

Safety

- Both physical and mental (e.g., judgement) safety

Over-competition

- Sport and physical activity becomes highly competitive experience in late-teen vs being a leisure / social option

Social norms

- Expectations on physical activity being a 'male' activity

Disabled Youth

Access

- Lack of suitable transportation to and from physical activity
- Lack of specialised facilities / equipment for physical activity

Affordability

- High cost of specialised equipment and facilities for participation

High deprivation

Access

- Lack of available facilities / activity in high deprivation communities

Affordability

- High relative cost of physical activity with other competing economic priorities (e.g., rent)

Time

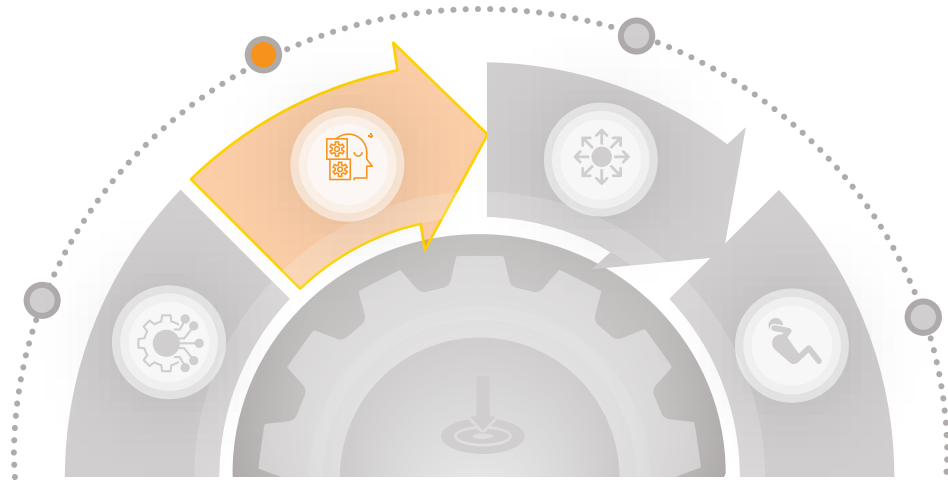- Other higher priorities than physical activity (e.g., work, family commitments)

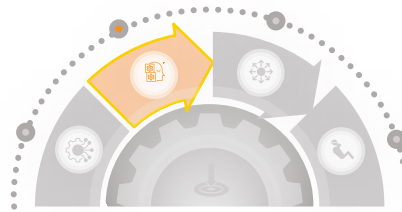### Asian / Pasifika

Cultural expectations

- **Asians:** General academic importance and focus driven from family expectations
- **Pasifika:** Girls face significant pressures to prioritise family commitments over personal interests

Mechanisms

Executive summary – technology mechanisms

- There are **9 main technology mechanisms** that impact physical activity drivers: gamification, socialisation, personalisation, intensification and democratisation of; knowledge, access, affordability, ability and time.

- In particular, **gamification, personalisation, socialisation and intensification** show the greatest alignment with drivers of physical activity for rangatahi (enjoyment & interest, and socialisation).

- **Democratisation (e.g., of time, access, and cost)** is a major mechanism of many technologies, and can potentially significantly impact barriers to physical activity that are **most prevalent in priority populations such as lack of time, access, and affordability**

- **Emerging technologies leverage one or more of these technology mechanisms** to influence behaviour, and individual technology use cases can be identified and assessed based on their specific mechanisms and the associated impact on drivers of physical activity.

- However, **research in this area is limited globally**, and therefore a hypothesis-driven 'theory of change' model can help to establish the link between a specific technology use case for rangatahi, the technology mechanism, and the drivers of activity.

We defined 9 relevant technology mechanisms...

Key technology mechanisms and their definitions

Gamification
Incorporating of incentives and challenges to increase the engagement, novelty or competitiveness of an activity

Intensification
Strengthening and/or deepening the user experience, encouraging interaction and engagement

Democratisation of affordability
Increasing accessibility to products and services at lower costs, breaking down economic constraints

Socialisation
Increasing opportunity for users to interact with one another through community building or facilitating connections

Democratisation of knowledge
Increasing accessibility to, and dissemination of information, increasing ability to learn

Democratisation of ability
Increasing range of accommodations made for people with different abilities

Personalisation
Tailoring products, services, and content to the individual user needs and preferences

Democratisation of access
Increasing accessibility to facilities / activities

Democratisation of time
Increasing flexibility in delivery of physical activities, allowing for greater convenience for users

…and identified how they impact physical activity levels in youths

Key technology mechanisms and their impact on physical activity

Gamification
Gamification can increase the engagement of youths in physical activity through incorporation of challenges, rewards, enjoyment or competition with others

Intensification
Intensification can create an immersive physical activity experience, making the experience more fun, and better capturing attention

Democratisation of affordability
Democratisation of affordability can make physical activity tools and resources available for youths at lower cost

Socialisation
Socialisation can allow youths to find people to participate in physical activity with, integrating physical activity with their social lives

Democratisation of knowledge
Democratisation of knowledge empowers youths with physical activity information, increasing awareness on participation means and channels

Democratisation of ability
Democratisation of abilities can allow people of different physical capabilities to participate at the same level

Personalisation
Personalisation in physical activity provides custom options and feedback specific to individual needs and preferences, boosting experience and adherence

Democratisation of access
Democratisation of access can make sports facilities and activities more widely available

Democratisation of time
Democratisation of time can allow youths with time constraints to engage in physical activities at their convenience

There is at least one mechanisms that targets each physical activity driver type

Driver / Mechanism	Personal						Social		Environmental		
	Enjoyment & interest	Development	Knowledge & awareness	Health & ability	Time	Cost	Social activity	Social encouragement & norms	Facilities / infrastructure	Weather	Safety
Gamification	🟩 Green	🟩 Green	⬜ Grey	🟨 Yellow	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey
Personalisation	🟩 Green	🟨 Yellow	⬜ Grey	🟨 Yellow	⬜ Grey	🟨 Yellow	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey
Socialisation	🟩 Green	🟨 Yellow	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	🟩 Green	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey
Intensification	🟩 Green	⬜ Grey	⬜ Grey	🟩 Green	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey
Democratisation of knowledge	🟨 Yellow	🟩 Green	🟩 Green	🟨 Yellow	⬜ Grey	⬜ Grey	⬜ Grey	🟨 Yellow	⬜ Grey	⬜ Grey	⬜ Grey
Democratisation of access	🟨 Yellow	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	🟩 Green	🟩 Green	🟩 Green
Democratisation of affordability	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	🟩 Green	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey
Democratisation of time	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	🟩 Green	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey	⬜ Grey
Democratisation of ability	🟨 Yellow	⬜ Grey	🟨 Yellow	🟩 Green	⬜ Grey	⬜ Grey	⬜ Grey	🟨 Yellow	⬜ Grey	⬜ Grey	⬜ Grey

🟩 Strong link between mechanism and driver   🟨 Some link between mechanism and driver   ⬜ Limited or no link between mechanism and driver

Source: Portas analysis

Gamification has been found to increase enjoyment and support skill development

Hypothesised theory of change – Gamification

Gamified physical activity can create engaging incentives boosting motivation for physical activity engagement

Enhances motivator	Reduces barrier
I like being active	I am not interested
I like the sport	Physical activity is not fun
I have fun	Sport is not fun
I like to win	I prefer other thing / activities
It improves my mental health	Physical activity is low on my priorities

Gamified activities can provide targeted challenges which acts as a roadmap for skill development

I can be more like my role model	I can prepare for event/competition
I develop sport skills	I develop life skills

↑ Enhances motivator   **Bold** – Study based impact
↓ Reduces barrier   *Italics* – Hypothesised impact

Supporting Research

- Meta-analysis of 16 longitudinal studies on gamified physical activity interventions found a small to medium positive impact of gamification on physical activity
    - No statistical differences across age groups suggesting good generalisability of results
    - No statistical differences between active and inactive control groups suggesting potential for gamified intervention across active and inactive populations

Considerations for Sport NZ

- Potential risks for youths in gamification should be considered (e.g., over competition, effects of positive vs negative reinforcement design).
- Explorations into the effects of gamification alongside other mechanisms such as personalisation could be taken into consideration (as seen in technologies such as esports).

Personalisation has been found to improve enjoyment, skill development and awareness

Hypothesised theory of change – Personalisation

Personalisation

Personalisation can increase user engagement by getting user invested in activity

I like being active / the sport

I have fun

I am not interested

Physical activity / sport is not fun

Personalisation can provide tailored guides for personal training and improvement

I can prepare for event / competition

Programmes / Coaching are too expensive

Personalised physical activity trackers can help improve awareness of personal health (e.g., fitness tracker metrics)

It improves my physical health

It helps me lose weight

Personalised content allow users to imitate their role models (e.g., in-game skins, targeted media feed)

I can be more like my role model

🟩 ↑ Enhances motivator   **Bold** – Study based impact
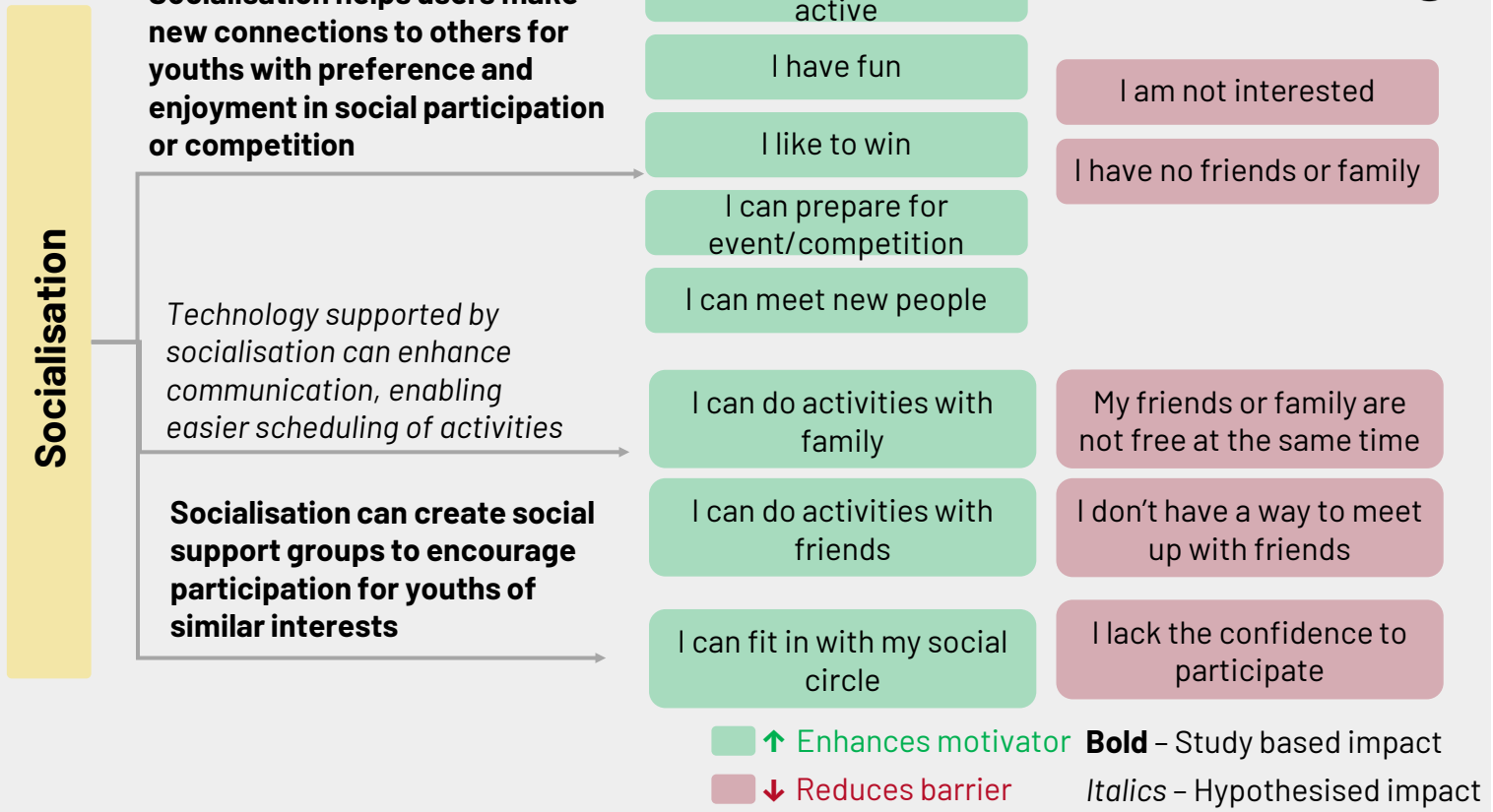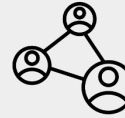🟥 ↓ Reduces barrier   *Italics* – Hypothesised impact

Supporting Research

- Analysis of 47 global studies show greater engagement and frequency of physical activity in 76% of studies when personalisation was used in PA interventions
- Limited research in long-term effects of physical activity trackers and their ability to effect PA in the long run
  - The research that does exist show that most people engage frequently with the tracker only in the first 30 days, with usage dropping off after. The study also focused on patients recovering from surgery
- Personalisation has been shown to be more effective for promoting frequency as opposed to intensity of physical activity

Considerations for Sport NZ
- Further exploration into different types of personalisation could identify optimum personalisation strategies for different demographic groups.

Socialisation can provide social support during activity and help boost confidence

Hypothesised theory of change – Socialisation

Socialisation

Socialisation helps users make new connections to others for youths with preference and enjoyment in social participation or competition

- I like the sport / being active
- I have fun
- I like to win
- I can prepare for event/competition
- I can meet new people

- I am not interested
- I have no friends or family

Technology supported by socialisation can enhance communication, enabling easier scheduling of activities

Socialisation can create social support groups to encourage participation for youths of similar interests

- I can do activities with family
- I can do activities with friends
- I can fit in with my social circle

- My friends or family are not free at the same time
- I don't have a way to meet up with friends
- I lack the confidence to participate

↑ Enhances motivator — **Bold** – Study based impact
↓ Reduces barrier — *Italics* – Hypothesised impact
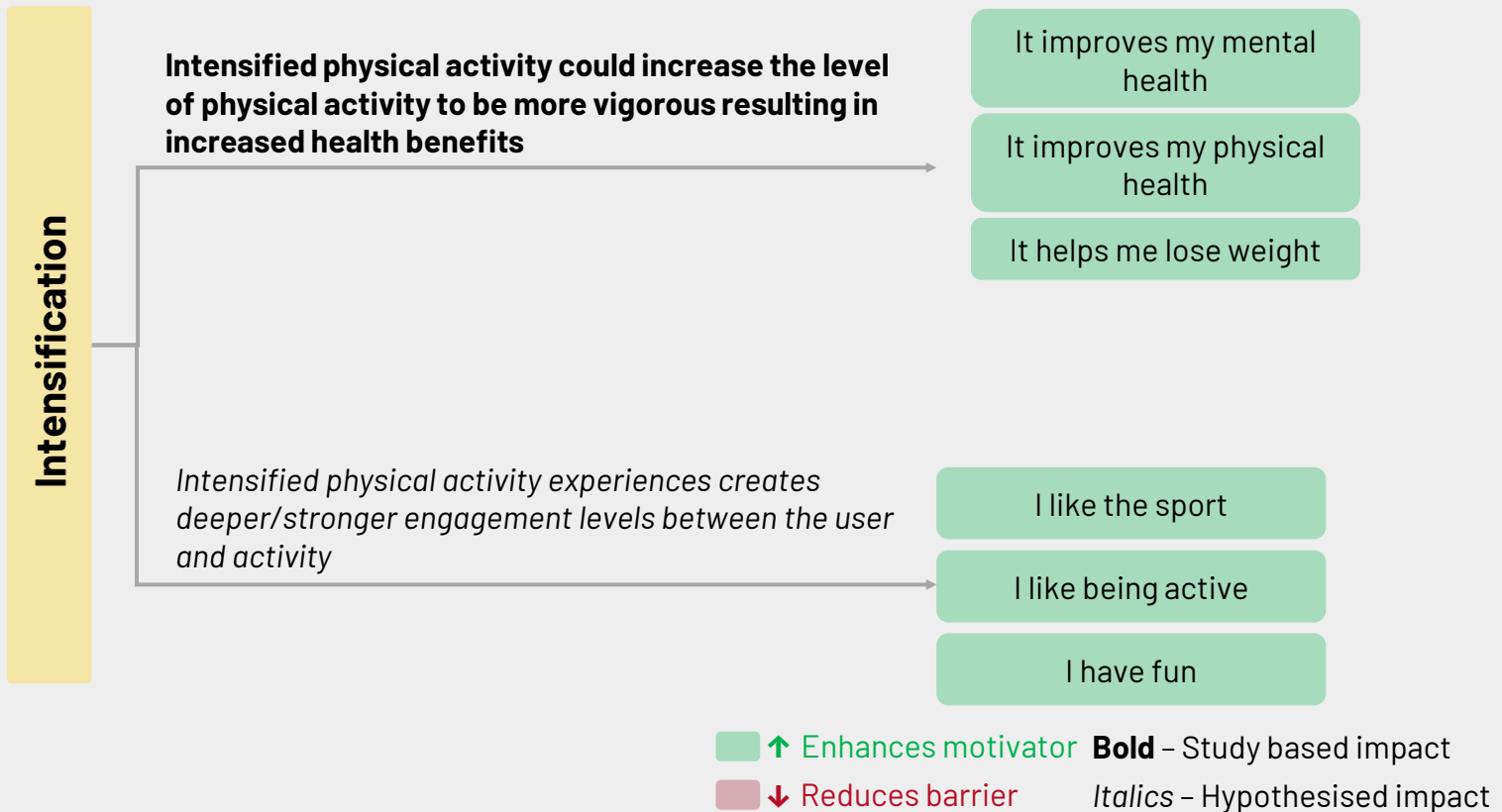
Supporting Research

- In a review of 106 studies, 77% showed associations between the influence of friends and the presence of physical activity in youths. Factors assessed includes:
  - Engagement with friends during PA (90% of studies that focused on this reported positive associations with youth's PA)
  - Physical activity of friends (85% of studies that focused on this reported positive associations with youth's PA)
  - Encouragement from friends (78% of studies that focused on this reported positive associations with youth's PA)

Considerations for Sport NZ

- Socialisation may also have adverse negative effects of (for e.g., if the social norms are negative) or increase barriers (e.g., increasing social anxiety), both of which are prominent barriers for girls and high dep groups.

Intensification has been found to lead to more intensive exercise and increase enjoyment

Hypothesised theory of change – Intensification

Intensification

Intensified physical activity could increase the level of physical activity to be more vigorous resulting in increased health benefits

- It improves my mental health
- It improves my physical health
- It helps me lose weight

Intensified physical activity experiences creates deeper/stronger engagement levels between the user and activity

- I like the sport
- I like being active
- I have fun

🟩 ↑ Enhances motivator   **Bold** – Study based impact
🟥 ↓ Reduces barrier   *Italics* – Hypothesised impact

Supporting Research

- A review of 86 studies on fitness in youth found health benefits to increased intensity of physical activity
- Highly immersive active video games have been shown to increase intensity of physical activity through higher levels of moderate-to-vigorous physical activity (MVPA) and increased time spent in MVPA
  - Most studies looked at the impact on young adults (primarily college-aged students), above the rangatahi age group

Considerations for Sport NZ

- Physical activity interventions that are "over-intensified" may have negative impact on physical activity (e.g., motion sickness).

Democratisation of knowledge reduces barriers to information, confidence and coaching

SPORT NEW ZEALAND IHI AOTEAROA

Hypothesised theory of change – Democratisation of knowledge

Democratisation of Knowledge

Democratising knowledge can provide access to information on how and what individuals can participate in (e.g., Youtube tutorials)

Democratising knowledge can reduce the dependence on coaches for the delivery of physical activity

I develop sports skills

I can develop life skills

It improves my physical health

It helps me lose weight

I can prepare for events / competitions

I can be more like my role model

I am not interested

I can't find information online

I lack the confidence to participate

My parents / friends don't want me to participate

There are no coaches for my sport

I lack confidence to participate

Coaches are fully booked

I don't like my coach

↑ Enhances motivator   **Bold** – Study based impact
↓ Reduces barrier   *Italics* – Hypothesised impact

Supporting Research

- Meta-analysis of 9 longitudinal study on the impact of physical activity mass media campaigns found that well-designed campaigns may increase the likelihood of achieving sufficient walking by 53%
  - Physical activity information campaigns may have a higher impact for low SES groups vs high SES groups
- Two studies on social media physical activity content found positive impacts on participation
  - Effect accentuated by social factors (e.g., influencers, peer groups)
- Studies considered not specific towards youths

Considerations for Sport NZ

- Need to ensure quality of information to safeguard youths from poor physical activity practices.
- Need to safeguard against potentially unhealthy content and influences (e.g., body image obsession).

Democratisation of access may reduce barriers related to safety, facilities and convenience

Hypothesised theory of change – Democratisation of access
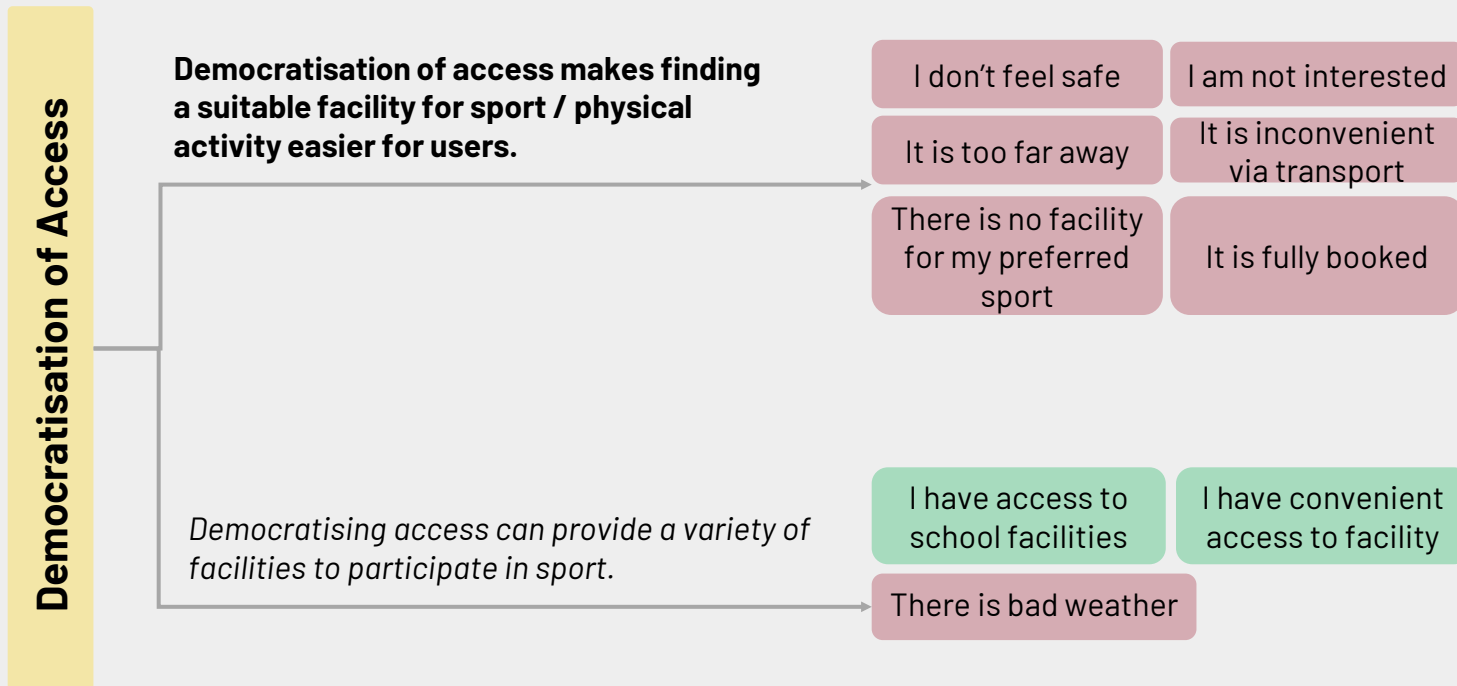
Democratisation of Access

Democratisation of access makes finding a suitable facility for sport / physical activity easier for users.

I don't feel safe	I am not interested
It is too far away	It is inconvenient via transport
There is no facility for my preferred sport	It is fully booked

Democratising access can provide a variety of facilities to participate in sport.

I have access to school facilities	I have convenient access to facility
There is bad weather	

↑ Enhances motivator — **Bold** – Study based impact
↓ Reduces barrier — *Italics* – Hypothesised impact

Supporting Research

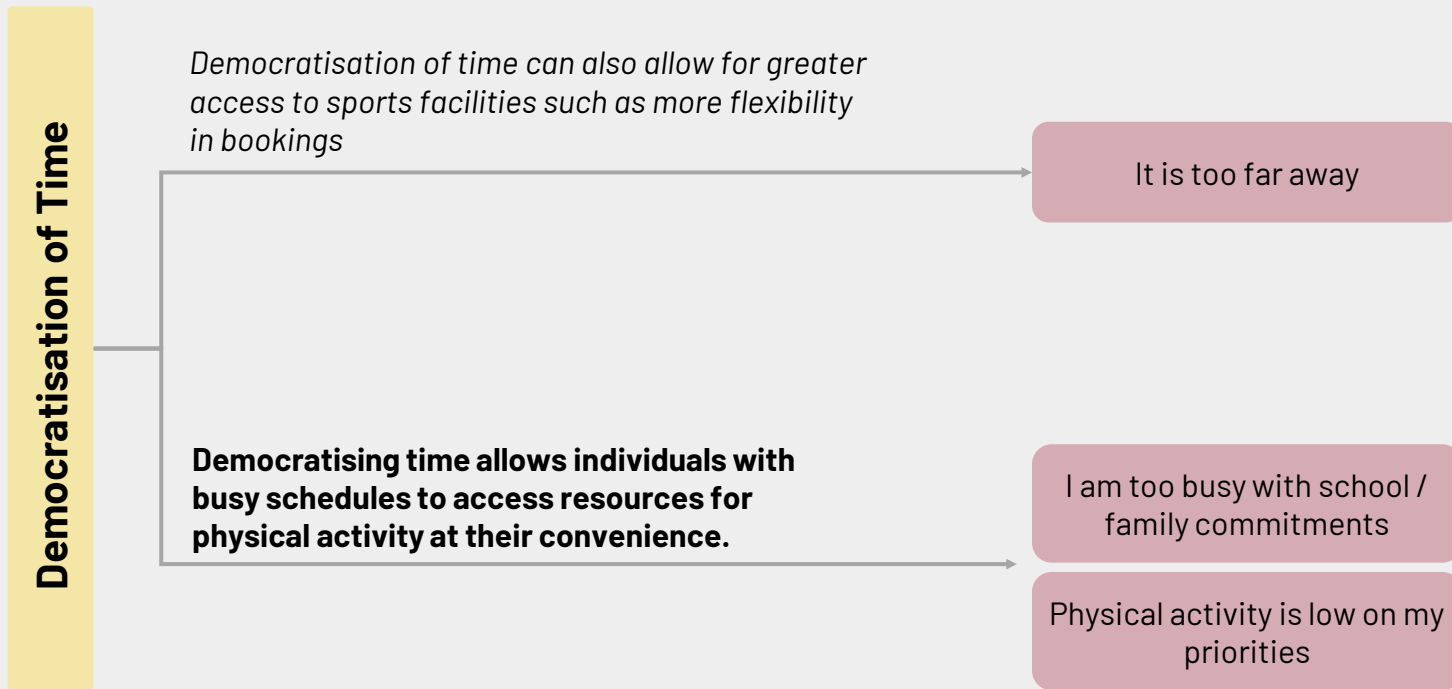- A cross-sectional study of Korean adults support the hypothesis that improved access to sports facilities increased the participation in PA
  - Study only consisted of adult participants from Korea
  - It has not been proven if the physical activity levels are a result of proximity to facilities or if the facilities were built to demand in that region
- Limited studies on technology specific interventions for facility access

Considerations for Sport NZ

- Need to ensure facilities can accommodate increased demand from wider access.

Source: Lee et al; (2016); Portas analysis

Democratisation of affordability may reduce barriers related to cost

Hypothesised theory of change – Democratisation of affordability

Democratisation of Affordability

Democratisation of affordability through technological advancements that drive down costs (e.g., automation, economies of scale, competition)

Accessing the facility is too expensive

Transport to the facility is too expensive

Equipment and apparel is too expensive

Democratisation of affordability through the availability of free to low-cost online content addresses cost-related barriers for programmes

Programmes or coaching are too expensive

↑ Enhances motivator   **Bold** – Study based impact
↓ Reduces barrier   *Italics* – Hypothesised impact

Supporting Research

- Research on public gyms and swimming pools show increased overall usage with free entrance fees
  - Higher impact for low-income populations
- Limited research available about the impact of cost reduction in other areas (transport, equipment / apparel or programmes / coaching)
- Limited research on technology specific interventions

Considerations for Sport NZ

- May be risks associated with unregulated online content.
- While lower facility costs may reduce barriers for those within close proximity to facilities, barriers related to cost of transport may remain for those who live further afield.

Democratisation of time may enable physical activity for those with other commitments

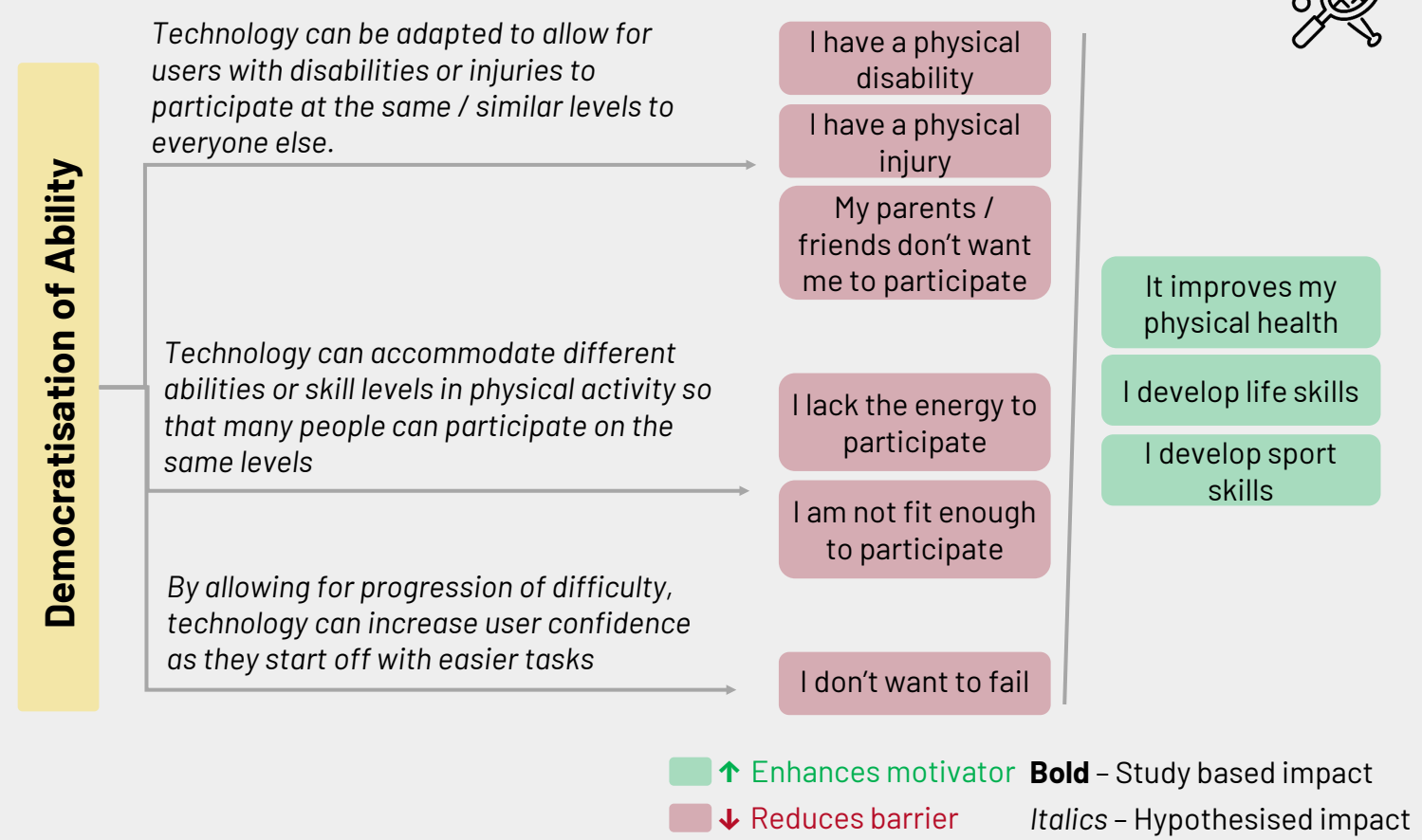## Hypothesised theory of change – Democratisation of time

Democratisation of Time

Democratisation of time can also allow for greater access to sports facilities such as more flexibility in bookings

It is too far away

Democratising time allows individuals with busy schedules to access resources for physical activity at their convenience.

I am too busy with school / family commitments

Physical activity is low on my priorities

🟩 ↑ Enhances motivator   **Bold** – Study based impact

🟫 ↓ Reduces barrier   *Italics* – Hypothesised impact

Supporting Research

- Study on instructor and virtual fitness classes involving >1.9k individuals showed that service convenience had a positive relationship with participation

- Study on intermittent activity suggested that small amounts of physical activity throughout day may be effective for individuals with time-barriers

- Limited academic research focused on youths

Considerations for Sport NZ

- Potential to explore technologies that can be integrated into daily life (e.g., apps prompting short activity breaks), requiring lower time commitments from users.

Democratisation of ability may support those with injuries, disability or aiming to improve skills

Hypothesised theory of change – Democratisation of ability

Democratisation of Ability

Technology can be adapted to allow for users with disabilities or injuries to participate at the same / similar levels to everyone else.

Technology can accommodate different abilities or skill levels in physical activity so that many people can participate on the same levels

By allowing for progression of difficulty, technology can increase user confidence as they start off with easier tasks

- I have a physical disability
- I have a physical injury
- My parents / friends don't want me to participate

- I lack the energy to participate
- I am not fit enough to participate

- I don't want to fail

- It improves my physical health
- I develop life skills
- I develop sport skills

🟩 ↑ Enhances motivator   **Bold** – Study based impact
🟥 ↓ Reduces barrier   *Italics* – Hypothesised impact

Supporting Research

- Anecdotal studies show that it is beneficial to learning new skills when challenges are presented in progressive difficulty
  - Limited studies available on the impact of success on confidence in the context of physical activity
- Research on physical education participation from disabled students indicate that confidence plays a large role in encouraging participation.
  - Only anecdotal research available

Considerations for Sport NZ

- High costs associated with technologies that democratise ability for disabled students (e.g., VR and/or AI –powered prosthetic limbs) may reduce overall impact for this segment.

Technologies

Executive summary – technology use cases

- **We identified 12 mainstream technology use cases** across esports, apps, web content, and hardware that appear to have the highest impact on the 9 mechanisms impacting physical activity behaviour.

- **Many technology use cases activate multiple mechanisms simultaneously.** The most common mechanisms that are activated are gamification, democratisation of knowledge and democratisation of access.

  — **8 technologies show the greatest alignment with the mechanisms that impact physical activity drivers for rangatahi**: Active esports, virtual sports, education and training apps, social fitness apps, social media, fitness blockchain, smart equipment and fitness trackers

  — **4 technologies show the best alignment with democratisation mechanisms for high deprivation groups disabled people**: Education and training apps, fitness aggregator apps, infrastructure and assistive technology.

  — While some technology use cases directly target physical activity, those with the highest potential tend to **leverage multiple mechanisms to influence behaviour,** with physical activity is only one outcome (e.g., social media influencers)

- When adding the lens of **adoption and accessibility**, social media and apps emerge as the technologies with high potential for priority segments as they have the highest current penetration and market maturity.

- Active esports, virtual sports, smart infrastructure and equipment, could have **high growth potential** given they are currently low on the technology maturity curve.

We have explored 12 technology use cases that are targeting these mechanisms (1/2)
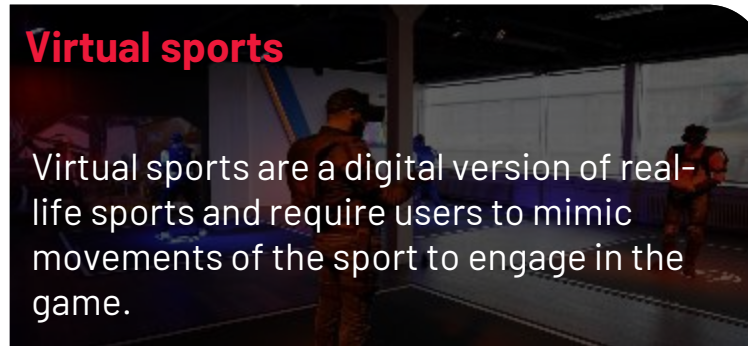
Esports
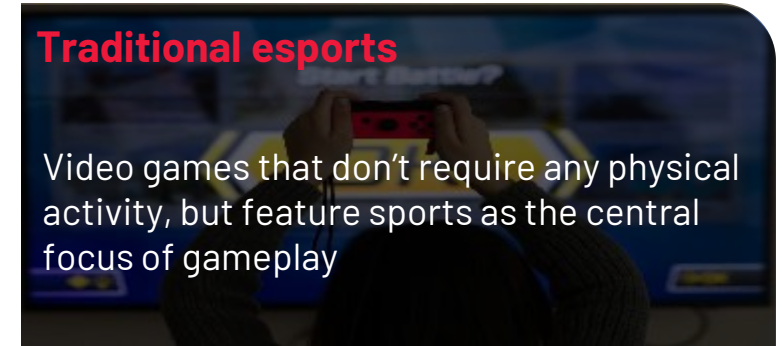
Active esports
Video games which require physical activity beyond that of traditional hand-controlled games.

Virtual sports
Virtual sports are a digital version of real-life sports and require users to mimic movements of the sport to engage in the game.
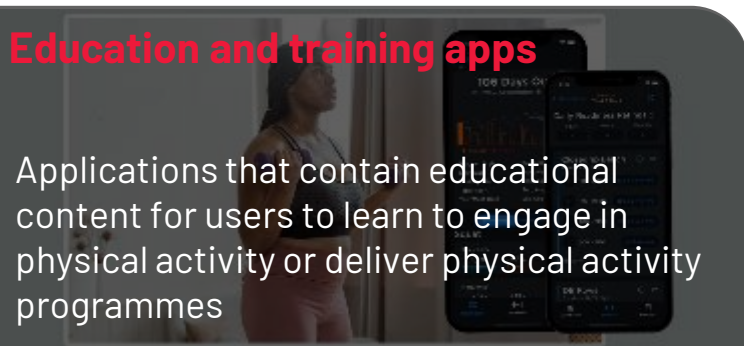
Traditional esports
Video games that don't require any physical activity, but feature sports as the central focus of gameplay
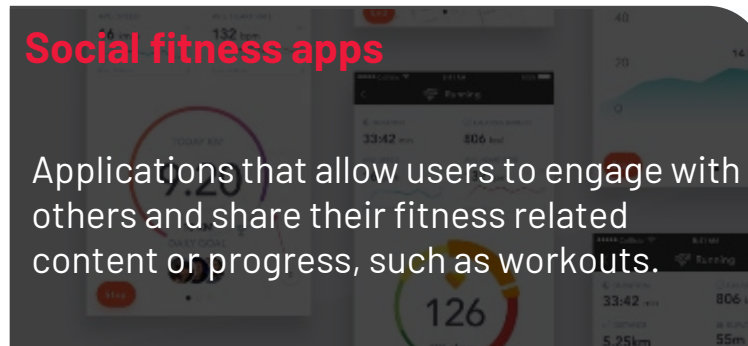
Apps
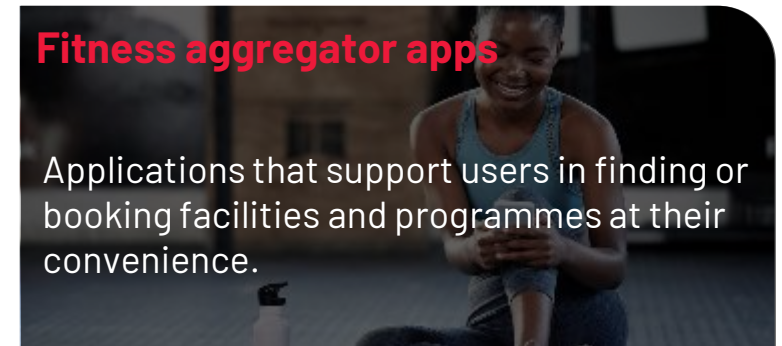
Education and training apps
Applications that contain educational content for users to learn to engage in physical activity or deliver physical activity programmes

Social fitness apps
Applications that allow users to engage with others and share their fitness related content or progress, such as workouts.

Fitness aggregator apps
Applications that support users in finding or booking facilities and programmes at their convenience.

We have explored 12 technology use cases that are targeting these mechanisms (2/2)

Web Content

Websites

Online media content typically accessed through one-way interaction from users
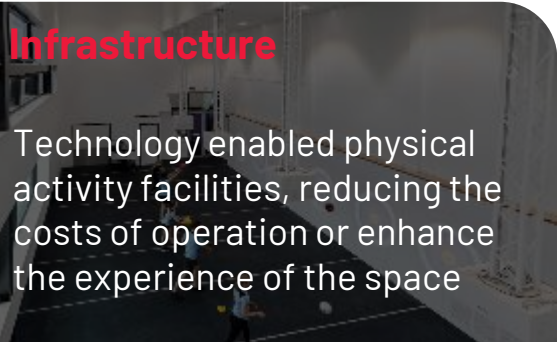
Social media

Online platforms that facilitate the creation and sharing of content through virtual communities and networks

Hardware

Infrastructure

Technology enabled physical activity facilities, reducing the costs of operation or enhance the experience of the space
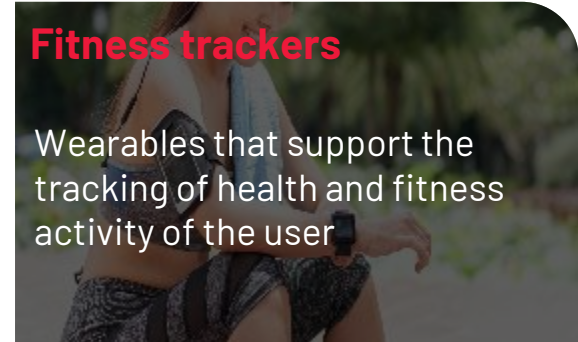
Assistive technology

Devices or equipment designed to enhance or enable participation in physical activity for individuals of differential abilities

Smart equipment

Technology enabled physical hardware to enhance the experience of physical activity

Fitness trackers

Wearables that support the tracking of health and fitness activity of the user

We did however consider multiple other technologies and their implications

Considerations for purpose of study

- Existing evidence base & use cases to support use by youth for physical activity

- Stage in technology lifecycle and associated adoption / hype cycle

Examples of emergent technology not included in study

Fitness blockchain
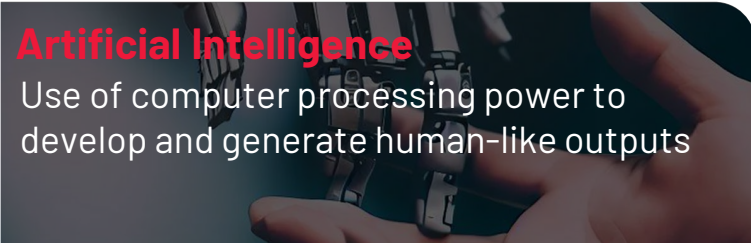A virtual environment leveraging blockchain and cryptocurrencies to promote physical activity in users.

Med-tech
Tools to monitor, manage or change physiological or biomechanical factors for individuals

Artificial Intelligence
Use of computer processing power to develop and generate human-like outputs

Potential for physical activity

- Record keeping and management of activity levels over time in de-centralized immutable contract independent from any governing body

- Targeted medical intervention reducing need for physical activity in population, specifically disabled people or priority communities.

- Mass production of targeted content for physical activity programming based on population demographics
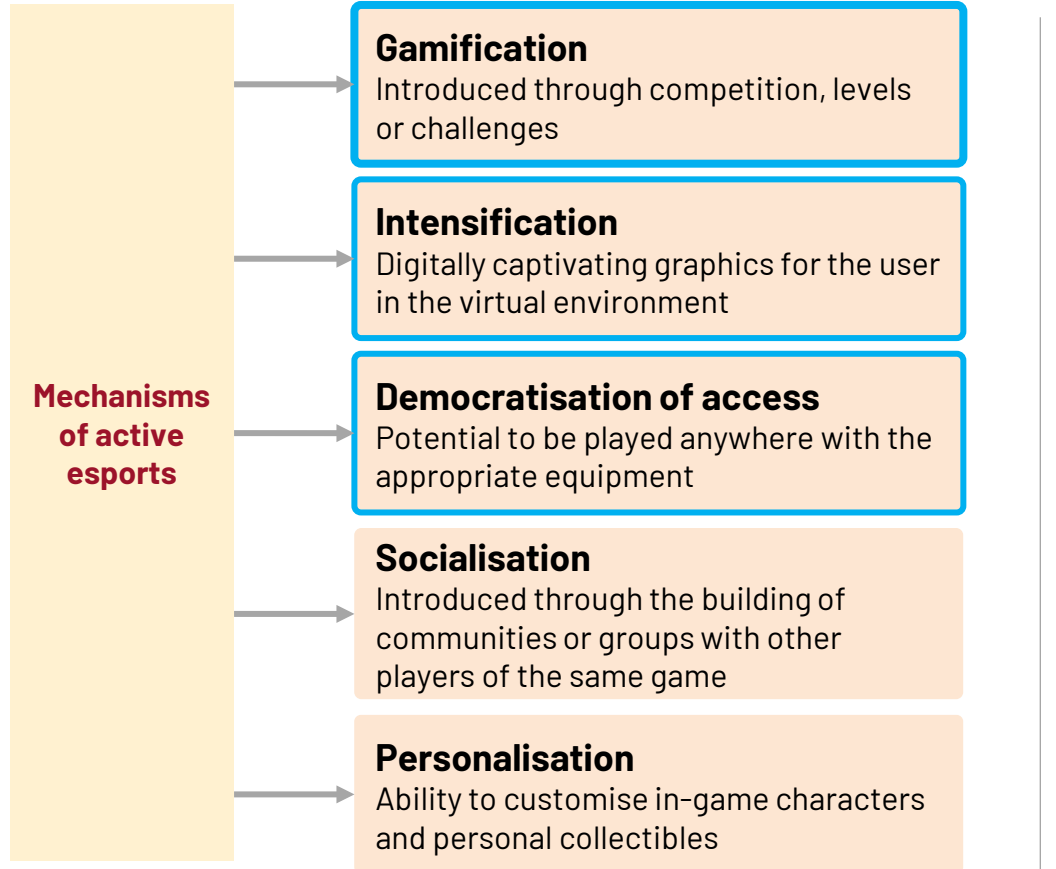
Each technology activates at least one or more mechanism

Technologies and their impact on mechanisms that drive physical activity

Technology / Mechanism	Gamification	Personalisation	Socialisation	Intensification	Democratization of knowledge	Democratization of access	Democratization of time	Democratization of affordability	Democratization of ability
Esports — Active esports	Strong	Some	Some	Strong	Limited	Strong	Limited	Limited	Limited
Esports — Virtual sports	Strong	Limited	Some	Strong	Some	Strong	Limited	Limited	Limited
Esports — Traditional esports	Limited	Limited	Some	Limited	Strong	Limited	Limited	Limited	Limited
Apps — Education and training apps	Some	Strong	Limited	Limited	Strong	Strong	Strong	Strong	Strong
Apps — Social fitness apps	Some	Strong	Strong	Limited	Limited	Limited	Limited	Limited	Limited
Apps — Fitness aggregators apps	Limited	Limited	Limited	Limited	Limited	Strong	Strong	Limited	Limited
Web Content — Websites	Limited	Limited	Limited	Limited	Strong	Some	Limited	Limited	Limited
Web Content — Social media	Limited	Some	Strong	Limited	Strong	Limited	Limited	Some	Limited
Hardware — Infrastructure	Limited	Limited	Limited	Limited	Limited	Some	Strong	Limited	Limited
Hardware — Assistive technology	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Strong
Hardware — Smart equipment	Strong	Limited	Limited	Strong	Some	Limited	Limited	Limited	Limited
Hardware — Fitness trackers	Strong	Some	Limited	Limited	Limited	Limited	Limited	Limited	Limited

🟩 – Strong link between technology and mechanism 🟨 – Some link between technology and mechanism ⬜ – Limited link between technology and mechanism

Active esports

Mechanisms of active esports

Gamification
Introduced through competition, levels or challenges

Intensification
Digitally captivating graphics for the user in the virtual environment

Democratisation of access
Potential to be played anywhere with the appropriate equipment

Socialisation
Introduced through the building of communities or groups with other players of the same game

Personalisation
Ability to customise in-game characters and personal collectibles

☐ Hypothesised primary mechanism(s)

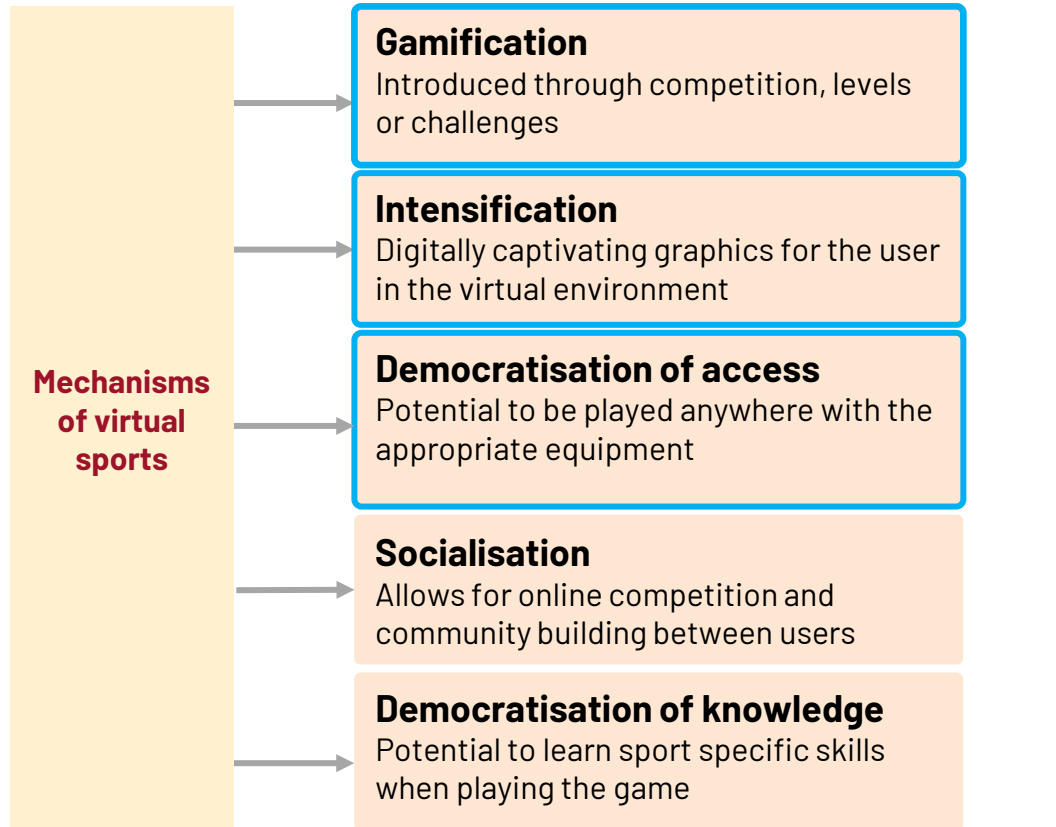## HADO: Immersive and personalised active game

Context: HADO is an active gaming experience leveraging on AR technology and motion sensor to allow for immersive and social play. Users can personalise their experience through their in-game characters. The game appeals to a large audience, especially amongst youths – the game can be played from ages 7 and up.

Impact: Growing popularity expanding to >35 countries since its founding in 2014. In August, New Zealand hosted its first HADO tournament with 8 youth teams taking part in the final knockout rounds.

Limitations: While research shows promising increase of physical activity amongst youth through active esports, interviews with stakeholders indicate that costs of such equipment is likely to be prohibitive for high deprivation groups.

Virtual sports

Mechanisms of virtual sports

Gamification
Introduced through competition, levels or challenges

Intensification
Digitally captivating graphics for the user in the virtual environment

Democratisation of access
Potential to be played anywhere with the appropriate equipment

Socialisation
Allows for online competition and community building between users

Democratisation of knowledge
Potential to learn sport specific skills when playing the game

☐ Hypothesised primary mechanism(s)

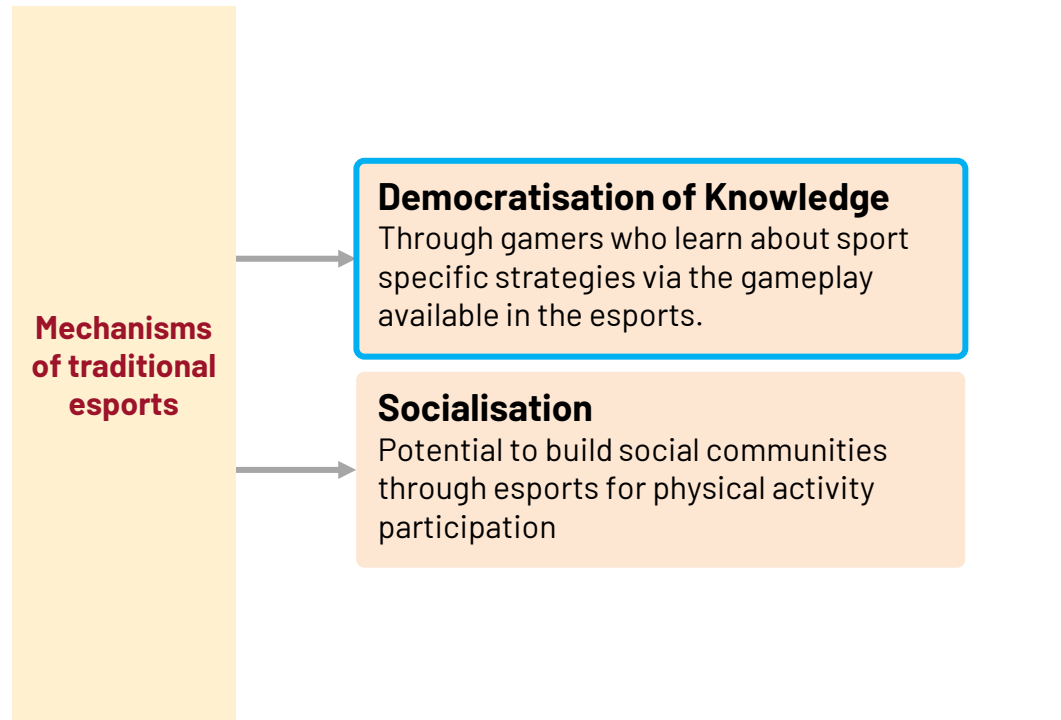## Virtual Taekwondo: Virtual participation in sport

Context: Featured at the inaugural Olympic Esports Week (OEW), virtual taekwondo works through VR technologies, tracking player movements and translating them into the game. It allows for users to spar against each other in non-contact virtual experiences.

Impact: The format of play allows for male and female players of all ages and skill levels to participate on a levelled playing field. At the OEW, both finalists of the competition were 14-year-old students who beat Olympic and world champions in earlier rounds.

Limitations: While the technology and immersive experiences are appealing to the targeted demographics, there may be some development required to make the technology accessible to some disabled groups. Discussions with stakeholders also indicate limitations in impact on rangatahi youth due to prohibitive costs of such technologies at present.

Traditional esports

NBA2K: Virtual gateway into basketball

Mechanisms of traditional esports

Democratisation of Knowledge
Through gamers who learn about sport specific strategies via the gameplay available in the esports.

Socialisation
Potential to build social communities through esports for physical activity participation

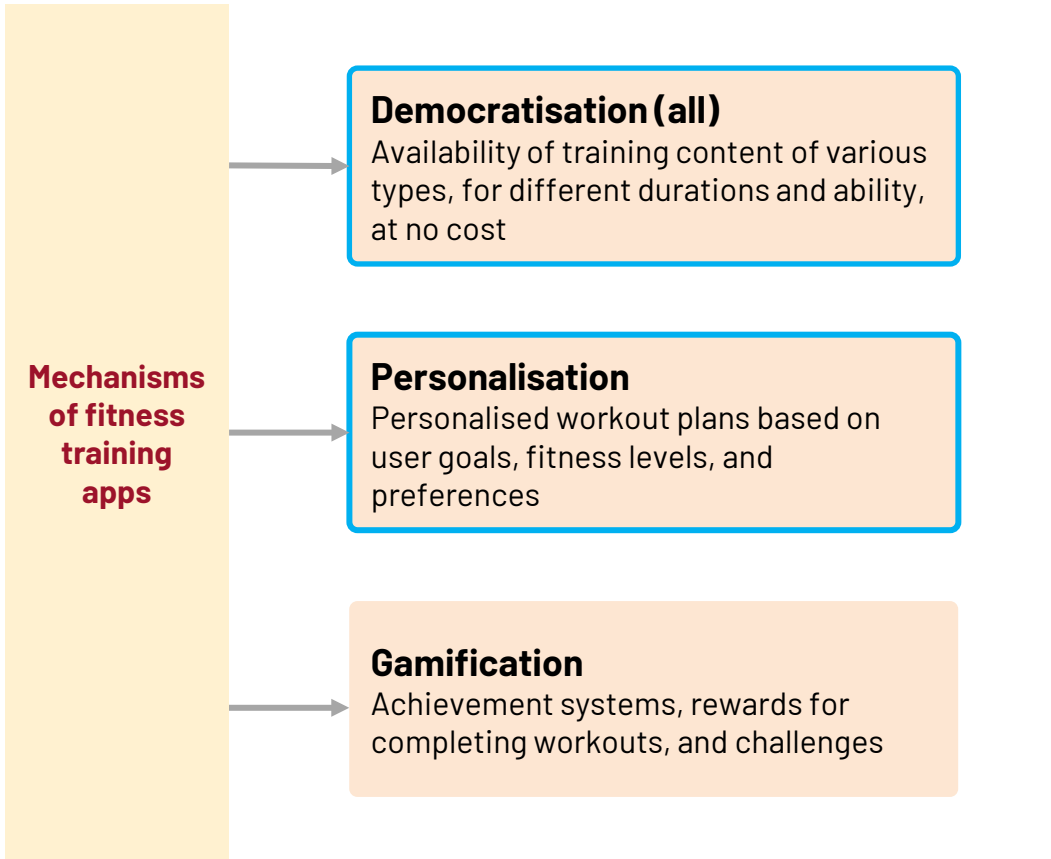☐ Hypothesised primary mechanism(s)

Context: NBA2K is a video game available on major console and desktop gaming platforms. One of the key highlights of the game is the perceived realism of gameplay and annual releases allowing for updates of the latest players within the NBA.

Impact: Several professional players within the NBA use the game to improve on strategy. There is also anecdotal evidence that NBA2K allows youth to learn about basketball fundamentals, increasing their confidence before taking to court in real life when they were previously intimidated by engaging with others on a basketball court.
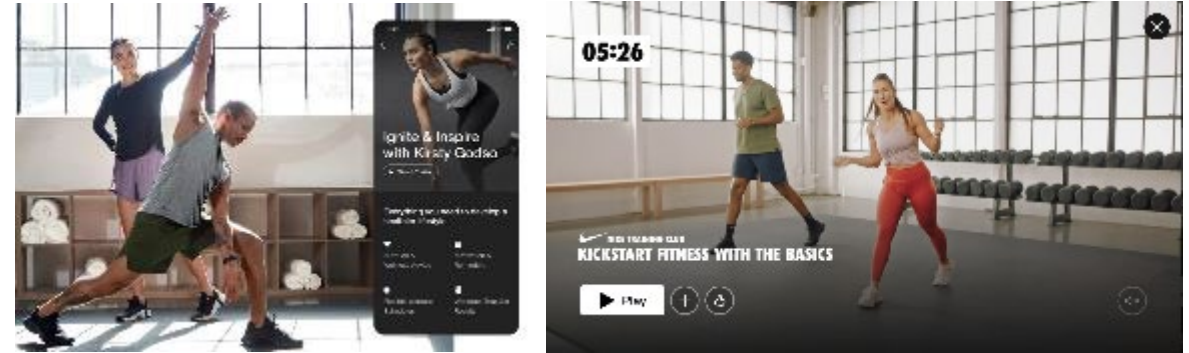
Limitations: Evidence on increase in real-life basketball participation from playing NBA2K has been anecdotal. Sport NZ could also consider the negative impacts from desktop and/or console games.

Fitness training apps

Mechanisms of fitness training apps

Democratisation (all)
Availability of training content of various types, for different durations and ability, at no cost

Personalisation
Personalised workout plans based on user goals, fitness levels, and preferences

Gamification
Achievement systems, rewards for completing workouts, and challenges

☐ Hypothesised primary mechanism(s)
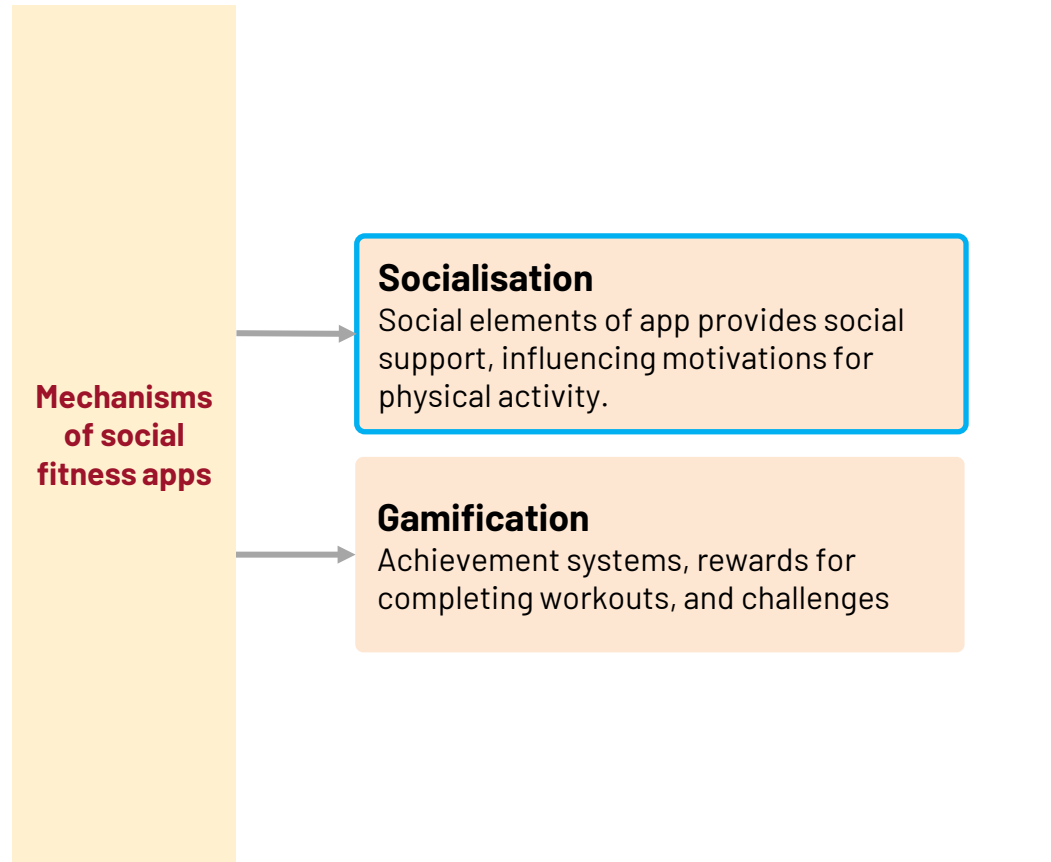
NIKE TRAINING CLUB: Fitness training app

Context: The Nike Training Club is a free app which provides over 185 exercises for different abilities, across different activity types (e.g., cardio, yoga), and durations. Customisable personal training plans adjusts to individuals' abilities, goals and schedules. The app gamifies the process to motivate users and increase retention through badges and trophies for reaching milestones.

Impact: To date, the app has 1.8 million active users, doing over 500k workouts per week. To increase reach to new (and potentially inactive) audiences, Nike collaborated with Netflix to release 20 programmes with a total of over 300 episodes on the platform.
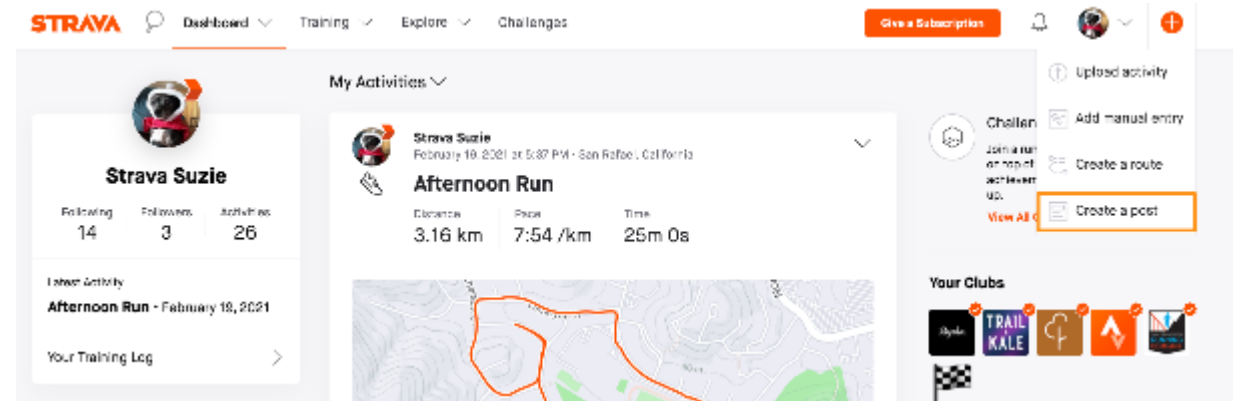
Limitations: There is limited data to identify if apps increase physical activity in inactive populations or simply increases accessibility to physical activity to already active populations.

Social fitness apps

Mechanisms of social fitness apps

Socialisation
Social elements of app provides social support, influencing motivations for physical activity.

Gamification
Achievement systems, rewards for completing workouts, and challenges

☐ Hypothesised primary mechanism(s)

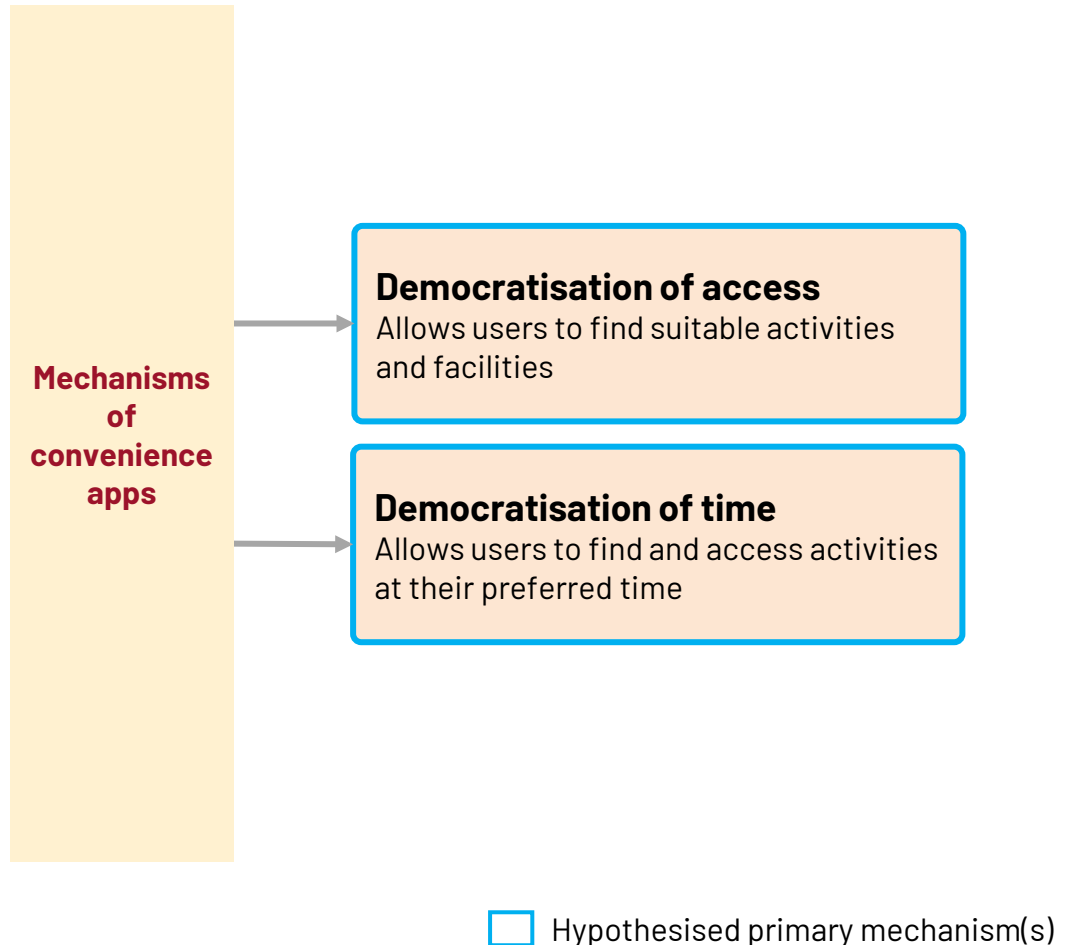**STRAVA:** Sharing fitness progress and updates

Context: Strava is a fitness app which allows users to track their workouts and share them with their community. Achievements are given for consecutive days of workout completion, meeting goals, etc.
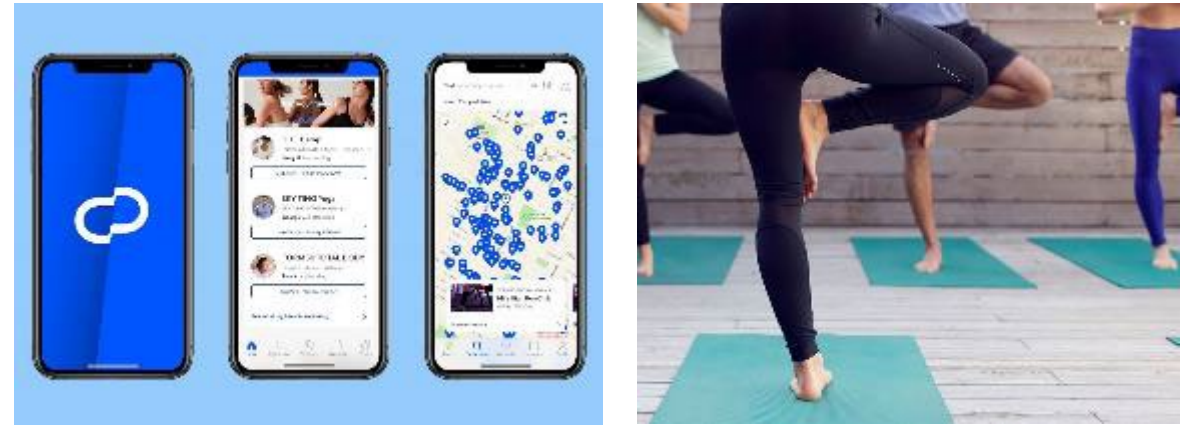
Impact: Globally popular, with over 100 million users across 195 countries, and used amongst professional athletes as well. Social features have been noted to be key in supporting consistency in people who want to get physically active.

Limitations: Apps vary greatly in functionality and features. For youths, the open nature of a social app may pose some risk to younger demographics. Limited research on impacts of apps for inactive groups (only in older adults), indicate moderate increases in physical activity after introduction of interventions. As such, in implementation, a more intentional strategy will need to be undertaken to get inactive populations on the app.

Fitness aggregator apps

CLASSPASS: Democratising fitness & wellness

Mechanisms of convenience apps

Democratisation of access
Allows users to find suitable activities and facilities

Democratisation of time
Allows users to find and access activities at their preferred time
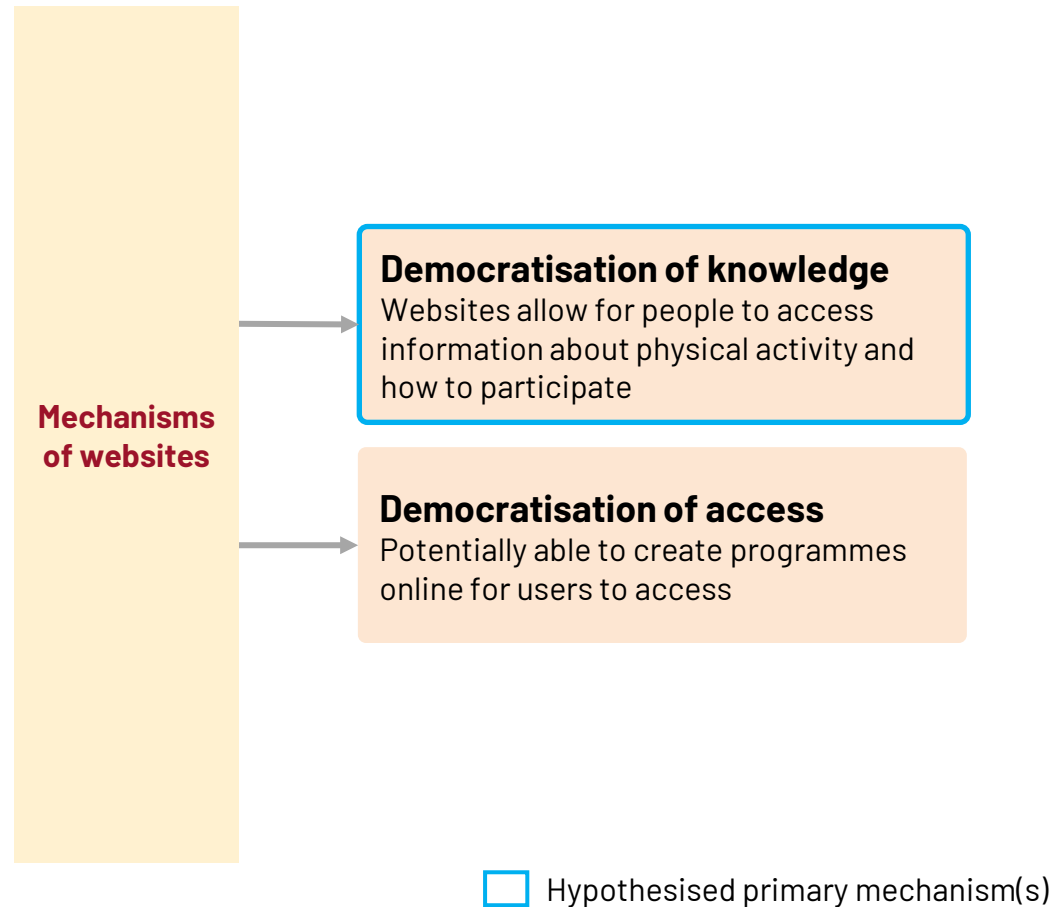

Context: Access to >30k health clubs across >30 countries, providing users access to a range of high-quality activities relating to fitness and wellness. Flexible credit-based booking system, allowing users to allocate their time across multiple services or programmes without long-term commitments.
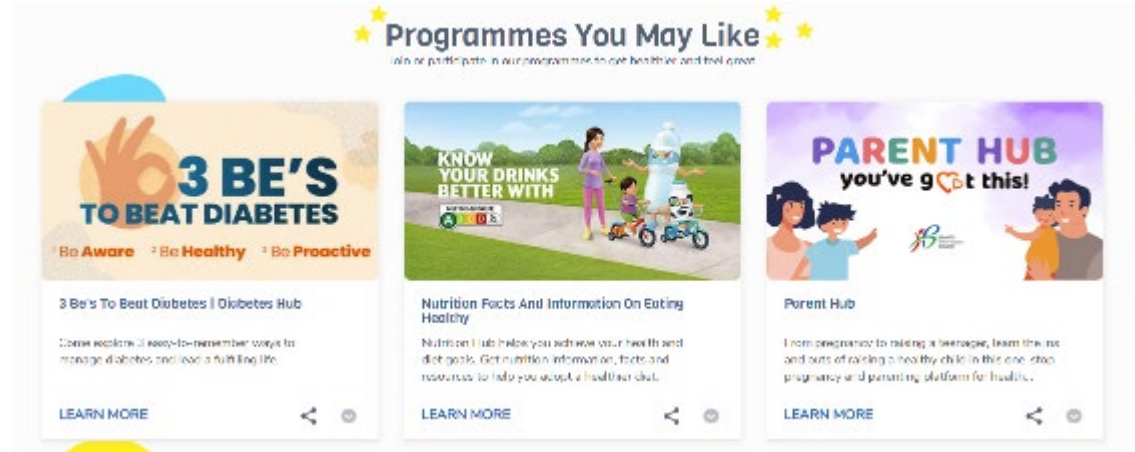
Impact: >60m fitness class reservations made through ClassPass annually. Growing number of aggregators in the fitness space, showing potential for growth in this market.

Limitations: There is limited research on the impact of fitness aggregators on existing inactive populations. Market assessors believe that there is potential for aggregators to reach new populations of currently inactive individuals through innovative marketing techniques.

☐ Hypothesised primary mechanism(s)

Websites

HEALTHHUB: National promotion of healthy living

Mechanisms of websites

Democratisation of knowledge
Websites allow for people to access information about physical activity and how to participate

Democratisation of access
Potentially able to create programmes online for users to access

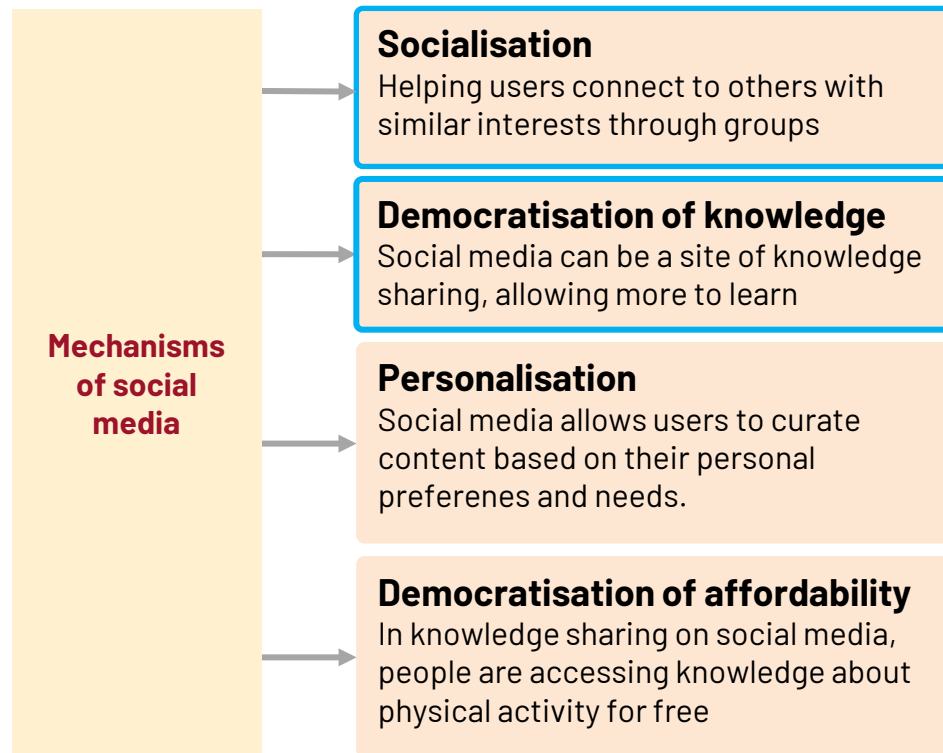☐ Hypothesised primary mechanism(s)

Context: HealthHub is a website developed by Singapore's Health Promotion Board. As part of a national health campaign, this website supports informing the public on ways to engage in physical activity, how parents can introduce children to physical activity, mental health support, etc.

Impact: Website draws approximately 870K viewers monthly in both organic and sponsored traffic.

Limitations: There are limited studies available on the impacts of web content independent from the use of social media for physical activity. A similar programme in England for national physical activity policies targeted intermediaries (e.g., coaches, parents), launching national guidelines to support coaches in delivering programmes, but with little indication of eventual results.

Social media

Mechanisms of social media

Socialisation
Helping users connect to others with similar interests through groups

Democratisation of knowledge
Social media can be a site of knowledge sharing, allowing more to learn

Personalisation
Social media allows users to curate content based on their personal preferenes and needs.

Democratisation of affordability
In knowledge sharing on social media, people are accessing knowledge about physical activity for free

☐ Hypothesised primary mechanism(s)

JOE WICKS: Online fitness influencer
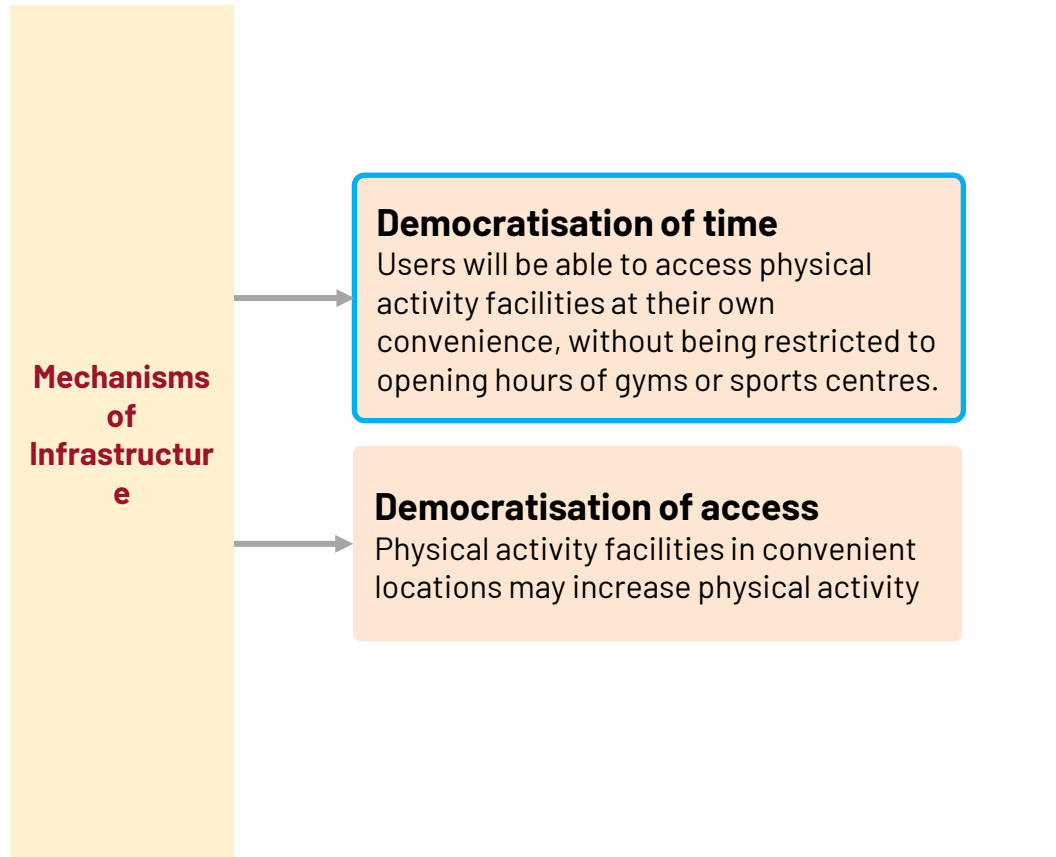

ULTIMATE BEGINNERS WORKOUT

Context: Joe Wicks is an online fitness influencer with >5m Instagram followers and >2.8m YouTube subscribers. Leverages platform for physical education in children and youths, publishing suitable workout videos online and touring schools to engage kids. Strong fitness community with group activities (e.g., parkruns) often attracting >1k people

Impact: Started 'P.E. with Joe' series on YouTube to provide physical education for children during the pandemic, with >2.8m views in first session alone

Limitations: The lack of regulation of social media makes it risky for youth as some fitness influencers have been reported to promote unhealthy diets and disordered eating, instead of promoting physical activity. There is also limited research to identify if the increase in physical activity is caused by the content produced or if followers were already leading physically active lifestyles.

Infrastructure

THE GYM POD: Private, 24-hour gym pods

Mechanisms of Infrastructure

Democratisation of time
Users will be able to access physical activity facilities at their own convenience, without being restricted to opening hours of gyms or sports centres.

Democratisation of access
Physical activity facilities in convenient locations may increase physical activity
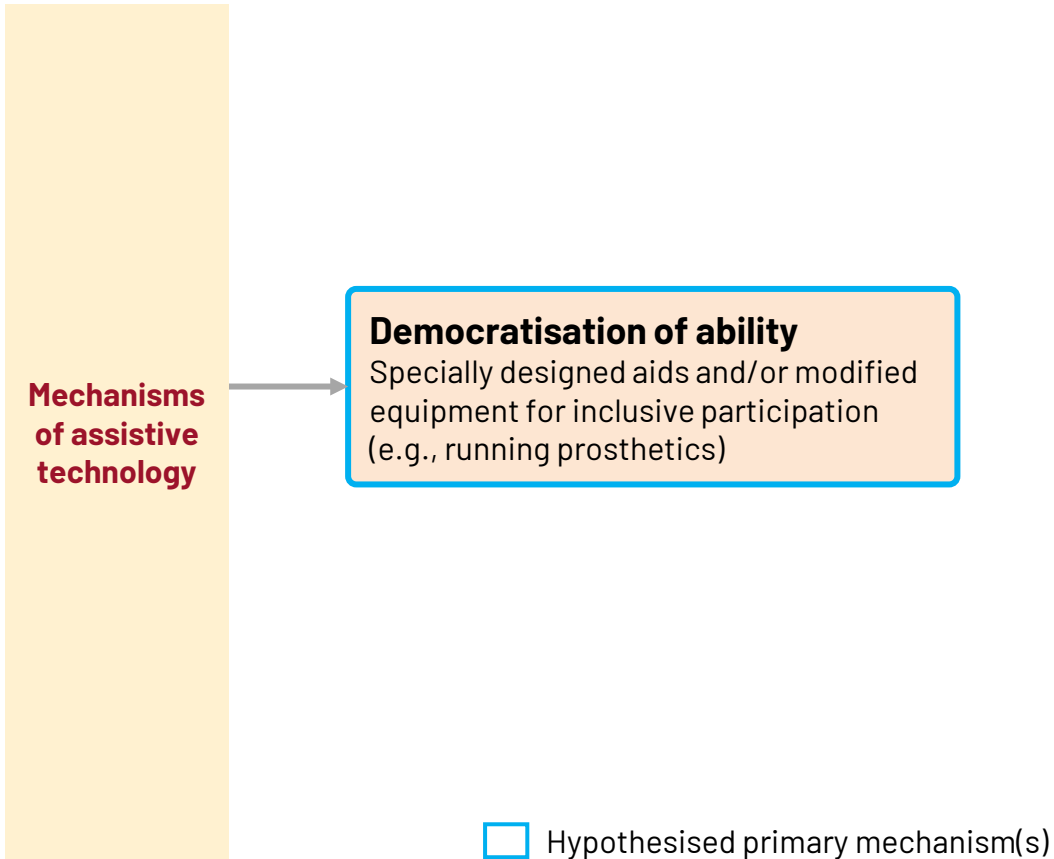
Context: The Gym Pod is a personal, unmanned gym which allow people access 24/7. There are a variety of pods available for different types of exercise (i.e., weight training, cardio), with 48 locations around Singapore for user convenience.

Impact: Over 120,000 registered users. Primary users have been working adults looking for a private space away from a public gym.

Limitations: Such products have not been designed for youths. Inactive youth who may need more guidance with starting physical activity will need more guidance and may not see benefits from independent time at a gym.

☐ Hypothesised primary mechanism(s)

Assistive technology

Mechanisms of assistive technology

Democratisation of ability
Specially designed aids and/or modified equipment for inclusive participation (e.g., running prosthetics)

□ Hypothesised primary mechanism(s)

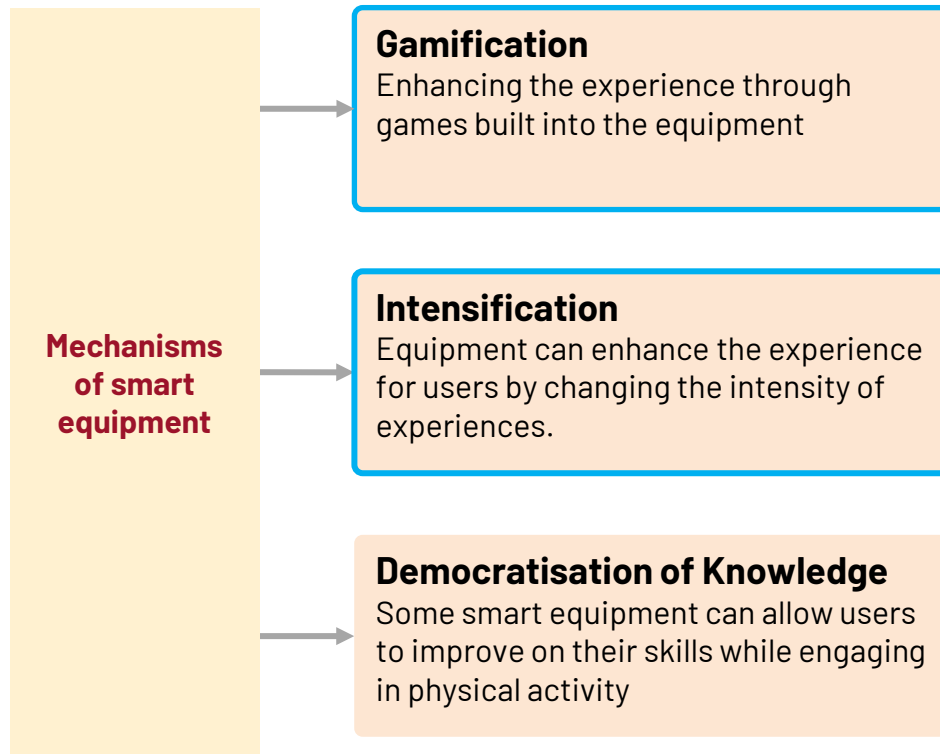**OTTOBOCK:** Manufacturer of sports prostheses

Context: Ottobock creates wearable human bionics to enable participation in physical activity for persons with disabilities. Different prosthetic products suited for different types of activity (e.g., long-distance, sprints, directional changes). Products can be customised to fit the individual needs of the user (e.g., body alignment).

Impact: Range of products designed specifically for youth physiology (e.g., bionic hand, wheelchair) may enable youth with physical disabilities to participate in sport.

Limitations: Sport prostheses are generally higher cost and are custom made, which may be prohibitive for high deprivation groups, and have limited impact on the general population.

Smart equipment

VALO CLIMB: Rock Climbing Enhanced through AR

Mechanisms of smart equipment

Gamification
Enhancing the experience through games built into the equipment

Intensification
Equipment can enhance the experience for users by changing the intensity of experiences.

Democratisation of Knowledge
Some smart equipment can allow users to improve on their skills while engaging in physical activity
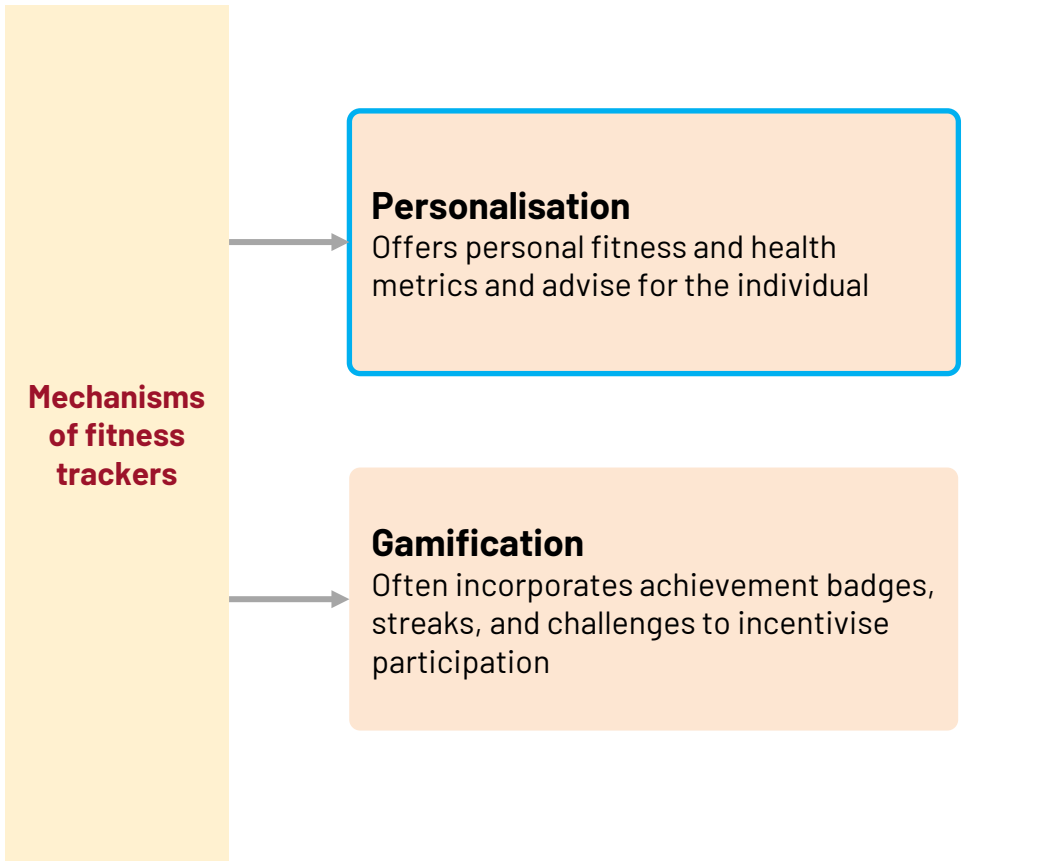
☐ Hypothesised primary mechanism(s)

Context: Valo Climb and several other companies have developed technology to add dimensions to the activity of rock climbing. The game features allow players to pit themselves against each other, while the guidance features support users in learning how to climb. The range of functionality can enhance the experience for participants.

Impact: Over 1000 mixed reality units sold across 60+ countries, and users have collectively burned over 350 million calories while using their mixed reality set-up.

Limitations: The technology used is comparatively new, and there has not been significant research on its long-term impacts on physical activity. Implementation of such technologies for youth will need to depend on installations in larger facilities due to costs of technology and infrastructure needed.

Fitness trackers

GARMIN / FITBIT: Wearable health and fitness trackers

Mechanisms of fitness trackers

Personalisation
Offers personal fitness and health metrics and advise for the individual

Gamification
Often incorporates achievement badges, streaks, and challenges to incentivise participation

Context: Fitness and health activity trackers measures various metrics (e.g., steps taken, heart rate, sleep patterns). Tracked metric gives user an awareness/feedback on key statistics to better inform health and physical activity behaviours. In-built mechanisms to incentivise physical activity (e.g., reminder nudge to move during a period of inactivity)

Impact: Est. 32% of 16–18 y.o. use wearables for physical activity. Studies not specific to youths have also shown impact of wearables on increasing daily steps.

Limitations: Effectiveness of leveraging fitness trackers as an intervention depend significantly on intervention design. Additionally, may be unaffordable and of non-priority for individuals in high deprivation area.

☐ Hypothesised primary mechanism(s)
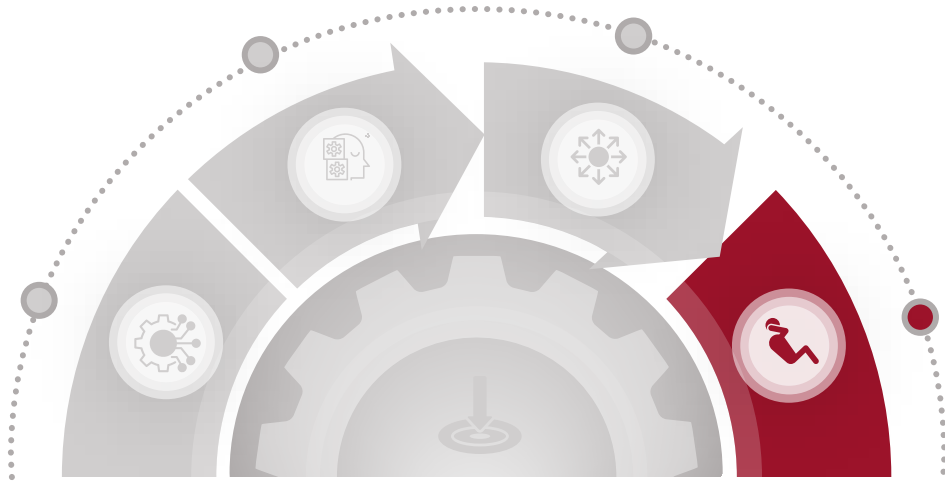
Implications and Considerations
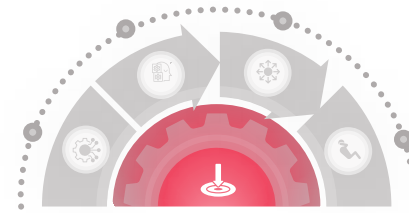
Implications and considerations

- Initial research and theory of change analysis suggests that there is **significant potential for technology to positively influence rangatahi physical activity particularly for priority groups** (e.g., girls, disabled people, high dep groups) by targeting most relevant drivers
- However, there are several considerations that need to be taken into account in choosing the appropriate strategy for Sport NZ:
  - There is a need to **fully understand the local context** of the interaction between rangatahi and technology to ensure any strategies are fit-for-purpose, locally applicable and culturally appropriate
  - Any implementation strategy must consider in advance, **specific rangatahi context and risks**, such as addiction, mental health, information quality and privacy
  - The speed of technological advancement is exponential, and therefore any strategy needs to **build in flexibility, adaptability and robust monitoring and evaluation** to ensure the desired outcomes are achieved and maintained for future generations
- Furthermore, there are additional considerations for Sport NZ in implementing technology solutions:
  - The **potential to integrate technology into and alongside Sport NZ's current existing activities and interventions** (e.g., Active As, Hawaiki Hou)
  - The **role of Sport NZ** (e.g., funding, facilitator, owner-operator etc.) **throughout whole-system** (from policy to the individual) to best foster long-term physical activity habits in rangatahi
  - **Effectiveness** in the delivery of technology-based interventions will **depend significantly on the design of the intervention to promote long-term uptake amongst rangatahi**

Beyond participation impact, three other factors also influence each technology's potential

Analysis of technologies' potential impact on youth's physical activity

Technologies	Adoption & accessibility	Potential for PA impact	Risks
Active esports	🔴 High-cost with limited adoption	🟢 High potential growth & impact	🔴 Potential for gaming addiction
Virtual sports	🔴 High-cost with limited adoption	🟢 High potential growth & impact	🔴 Potential for gaming addiction
Traditional esports	🟢 Widely accessible and used by youths	🔴 Low potential impact	🔴 Potential for gaming addiction
Fitness training apps	🟡 Primarily used by currently active youths	🟡 High maturity & impact	🟢 Typically curated professional content
Social fitness apps	🟡 Primarily used by currently active youths	🟡 High maturity & impact	🟡 Privacy concerns; over competition
Fitness aggregator apps	🟡 Primarily used by currently active youths	🟡 High maturity & impact	🟢 Limited risks in usage
Websites	🟢 Widely accessible and used by youths	🟡 High maturity & impact	🟡 Potential of misinformation
Social media	🟢 Widely accessible and used by youths	🟡 High maturity & impact	🔴 Negative impact on mental health
Fitness blockchain	🔴 Niche technology with limited adoption	🟢 Low potential impact	🟡 Subject to stability of tokens
Infrastructure	🔴 Limited provision	🟢 High potential growth & impact	🟢 Limited risks in usage
Assistive technology	🔴 High-cost with limited adoption	🔴 Low potential impact	🟢 Typically regulated by professionals
Smart equipment	🔴 High-cost with limited adoption	🟢 High potential growth & impact	🟢 Limited risks in usage
Fitness tracker	🟡 Primarily used by currently active youths	🔴 Low growth headroom	🟢 Limited risks in usage

# Low-cost online social activities see the highest adoption and accessibility across youths

Adoption and accessibility

Popular technologies used by youths	Adoption rate (16–18 y.o.)[1]	Accessibility assessment Criteria: availability, affordability, awareness, accessibility, ability
Social Media	98%	▪ Highly accessible from mobile devices and PCs ▪ Core social tool for youths
Play video games	92%	▪ Highly accessible through mobile devices, PCs, and consoles ▪ Social activity for youths ▪ Parental controls may limit access
Online or tech assisted physical activity coaching	41%	▪ High availability of free to access content online (e.g., Youtube) ▪ Parental controls may limit access
Wearables for physical activity	32%	▪ Relatively high-cost inhibit youth adoption without parental purchase ▪ Mostly designed for adults, features may not be youth-centric
Online bookings of physical activity	25%	▪ Cost of physical activity programmes may be inhibitive for youth access
Sports focused mobile app e.g., Strava	20%	▪ Highly accessible from mobile devices and PCs
VR/AR for physical activity	16%	▪ Relatively high-cost for VR/AR capable devices inhibit youth adoption without parental purchase

Initial comparison and assessment based on available global data, contextualised assessment required to understand NZ tech landscape *(e.g., 2018 NZCVS data reported that 0.9% of 15-19 years old do not have access to the internet; 2015 PISA survey reported that Pasifika students have lowest internet access rates (74%) vs other ethnicities)*

Potential for PA impact can be assessed on current maturity of technology & innovation

Technical maturity and innovation potential

High potential for impact (now)

High potential for impact (future)

Technology maturity

Potential impact on PA
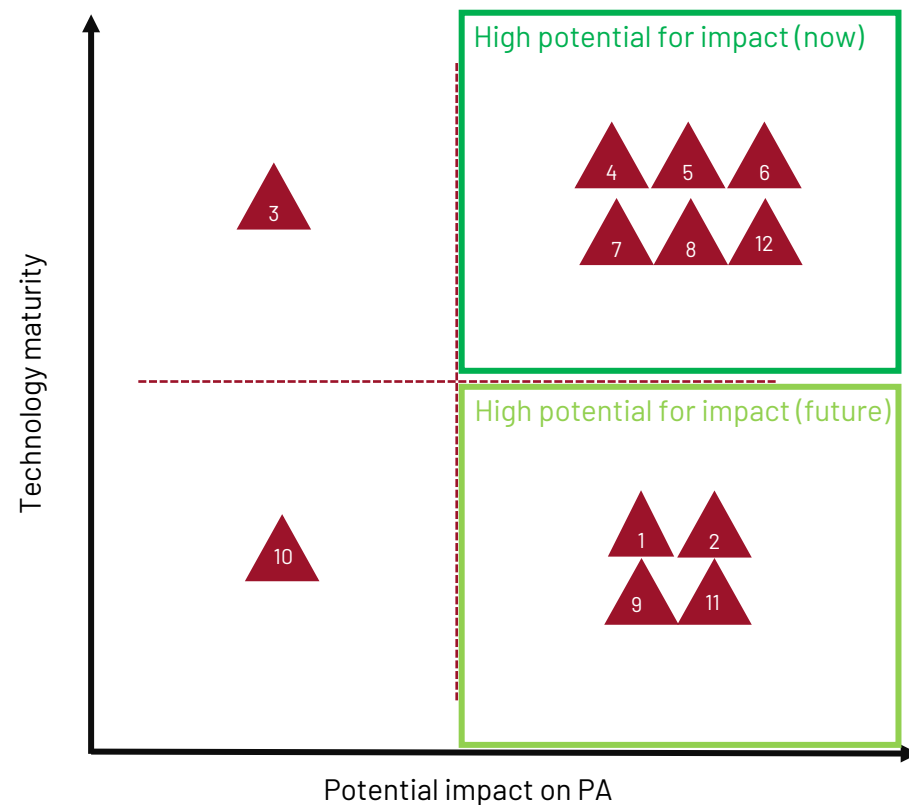
1	Active esports
2	Virtual sports
3	Traditional esports
4	Fitness training apps
5	Social fitness apps
6	Fitness aggregator apps
7	Websites
8	Social media
9	Infrastructure
10	Assistive technology
11	Smart equipment
12	Fitness trackers

- Sport NZ (SNZ) should aim to leverage technology that has high maturity and reach, with investment focused on specific interventions to leverage the technology for youth PA.

- However, innovative and emergent technologies with high potential for PA impact should form the pipeline for SNZ to develop.

- SNZ's role in driving innovation and adoption should be carefully considered in the context of the broader sports technology ecosystem.
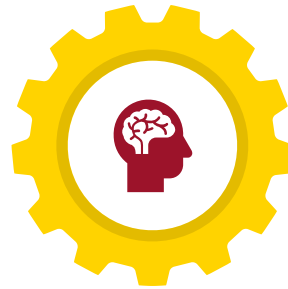
However, there are four key risks that must be considered in leveraging tech for participation

Risks

Addiction:
Highly gamified and socialised products run the risk of addiction amongst youth

Mental health:
Highly socialised online environments may result in unhealthy competition and comparison amongst youth

Quality of information:
Unvetted online information may provide untrue and/or harmful physical activity knowledge for youths

Privacy consideration:
Data for personalised insights on individual youths may infringe on privacy for youths

Relevant technologies	• Esports • Social media • Web content	• Esports • Social media	• Web content • Social media	• Fitness trackers • Apps

Appendix

Contents

Additional case studies of technologies related to physical activity (1/6)

Case Study	Type of Technology	Description of technology and impacts
WallJAM (www.walljam.com/)	Smart equipment	Interactive rebound wall that analyses ball strikes based on sensor targets. App allows users to play games and compare results. Mechanism(s): Gamification
TOCA Football (www.tocafootball.com/)	Smart equipment / infrastructure	A tech-enabled football training facility aimed at increasing engagement in learning football for all ages (18-months to adulthood) Mechanism(s): Gamification, intensification, democratisation of ability
Skills Lab Arena (www.skills-lab.com/en/arena/)	Smart equipment / infrastructure	Digitally gamified football training system for measurable progress and delivering an immersive, data-driven training experience. Mechanism(s): Gamification, intensification, personalisation
STEP'N (www.stepn.com/)	Fitness blockchain	Virtual marketplace trading NFTs (sneakers) with tokens earned from walking / jogging Mechanism(s): Gamification
Fitlink (https://fitlinkapp.com/)	Social fitness apps	Built for work teams, creates incentives for people to set wellbeing goals and rewards for meeting goals Mechanism(s): Gamification, socialisation, personalisation
Blazepod (www.blazepod.com/)	Smart equipment	Light-up buttons with programmable games / trainings. Targeted at athletes to strengthen reflexes. Mechanism(s): Gamification, intensification, democratization of access
Black Box VR (www.blackbox-vr.com/)	Active esports	VR gym combining immersive gameplay and real-life resistance training. Mechanism(s): Gamification, intensification, personalisation

Additional case studies of technologies related to physical activity (2/6)

Case Study	Type of Technology	Description of technology and impacts
LAZR (lazr-fitness.com/)	Smart equipment	Laser tag game in a small space, powered by physical activity. Mechanism(s): Gamification, intensification
Find-A-Race (https://findarace.com/)	Fitness aggregator app	UK-based platform to find running events to enter Mechanism(s): Democratisation of knowledge
Active Things (activethings.app/)	Fitness aggregator app	Platform to inform users about ways to participate in active activities around their area Mechanism(s): Democratisation of knowledge
Playfinder (www.playfinder.com/)	Fitness aggregator app	Find and book sports facilities in the UK Mechanism(s): Democratisation of time
Orfi Active (www.orfiactive.com/)	Fitness aggregator app	Find and book sports activities around you. Organisers can communicate with and schedule participants Mechanism(s): Democratisation of time, democratisation of access
Lupa Run (www.lupa.run/)	Fitness training app	Programmes designed to support people training to run over various distances Mechanism(s): Democratisation of ability, democratisation of knowledge
Exi (https://www.exi.life/)	Education and training app	Physical activity coaching support for people with chronic conditions Mechanism(s): Democratisation of knowledge, democratisation of ability, personalisation
Pace to Race (www.pacetorace.com/)	Education and training app	AI pacer for running coaching Mechanism(s): Democratisation of knowledge, democratisation of ability
miMove (www.mimoveapp.com/)	Fitness tracker	App enabling students to log physical activity data and supports teachers in managing data from students. Mechanism(s): Personalisation

Additional case studies of technologies related to physical activity (3/6)

Case Study	Type of Technology	Description of technology and impacts
It's My Move (www.itsmymove.org.nz)	Website / Campaign	Physical activity campaign targeted towards young women with online content on suitable workouts and guidance for parents and providers on how they can better support Mechanism(s): Democratisation of knowledge, democratisation of access
Eyeclick (www.eyeclick.com/)	Smart equipment	Interactive projectors with interactive games designed for young children. Participants must interact with the projected games physically (i.e., jumping on, touching, etc.) to engage in the game. Mechanism(s): Gamification
JABII (www.jabii.com/)	Smart equipment / Active esports	A digitally-enhanced toy that allows people to integrate exercise into play. Includes a mobile app to further enhance the experience. Mechanism(s): Gamification
CSE Entertainment (www.cse.is/)	Active esports	Their product, iWall is an interactive game area that allows people to play games through physical movements Mechanism(s): Gamification, intensification
Moki Health (moki.health/)	Fitness tracker	A wristband for young children that tracks physical activity. Includes leaderboards for classes and a classroom management system for teachers. Mechanism(s): Gamification, personalization
Quell (playquell.com/)	Active esports	Handheld controllers and body sensors that enable users to play games that require active movements. Mechanism(s): Gamification, intensification
Funky Bots (www.funkybots.com/)	Active esports / Fitness training app	A mobile app that provides a gamified environment for children to learn dance and martial arts. Mechanism(s): Gamification, democratisation of knowledge

Additional case studies of technologies related to physical activity (4/6)

Case Study	Type of Technology	Description of technology and impacts
FitXR (fitxr.com/)	Active esports	Virtual reality experience focused on creating workouts Mechanism(s): Gamification, intensification
Katalyst (www.katalyst.fit/)	Smart equipment	Using electro muscle stimulation in a bodysuit to increase effectiveness of exercise Mechanism(s): Intensification
Trackbar (www.trackbar.com/)	Smart equipment	Fitness equipment enhanced with on-screen game to train and guide users Mechanism(s): Gamification, intensification, personalisation
Netfit NZ (netfitnetball.co.nz/)	Education and training app	Supports training and coaching of netball players through sport specific exercises on app Mechanism(s): Democratisation of access, democratisation of knowledge
Halberg Foundation (www.halberg.co.nz/)	-	Developing a digital course to educate coaches and teachers on running accessible physical activities Mechanism(s): Democratisation of knowledge
PaddleAble (www.paddler.nz/)	Virtual sports	Developing inclusive paddle experiences for disabled individuals who may not be able to experience water sports Mechanism(s): Democratisation of ability
Recreation Aotearoa (www.nzrecreation.org.nz/)	Fitness aggregator	(In development) System to inform people with disabilities on accessibility in walking and cycling tracks Mechanism(s): Democratisation of knowledge
Coachmate (www.coachmate.sport/)	Education and training app	Supporting grassroots coaches in delivering participation level sports for youth Mechanism(s): Democratisation of knowledge

Additional case studies of technologies related to physical activity (5/6)

Case Study	Type of Technology	Description of technology and impacts
Zwift (www.zwift.com)	Virtual sports	Virtual cycling and running training program that allows users to exercise and compete in a digital world Mechanism(s): Gamification, intensification, democratisation of access, socialisation *TriNZ currently leverages Zwift platform as a broader community/organisation tool to increase engagement with the sport*
Dance Dance Revolution (www.ddrgame.com/)	Active esports	Rhythm-based video game where players step on a dance platform to match on-screen arrows to the beat of music Mechanism(s): Gamification, intensification
Move to Game (www.sportsforall.com.sa/tag/move-to-game)	App	Campaign in Saudi using activity tracking app rewarding physical activity with gaming-related financial incentives Mechanism(s): Gamification
Oura Ring (www.ouraring.com)	Fitness trackers	Wearable ring tracking sleep, activity, and body temperature to provide insights into overall health and wellness Mechanism(s): Personalisation
Smart Mat (www.smartmat.com)	Smart equipment	A digital mat embedded with sensors to monitor and analyse postures, used for fitness, yoga, or rehabilitation Mechanism(s): Personalisation, democratisation of time, democratisation of access, gamification
NIKE unlimited stadium	Infrastructure	LED running track in Manila, Philippines where runners can virtually race against themselves Mechanism(s): Gamification, intensification, personalisation
Good Boost (www.goodboost.ai)	Education and training app	App delivering therapeutic exercise and wellbeing programmes focused on individuals of lower physical ability Mechanism(s): Democratisation of ability, democratisation of knowledge, democratisation of access
LYMB.io (www.lymb.io)	Smart equipment	Projected AR product merging sports and gaming for an interactive and immersive physical activity experience Mechanism(s) Gamification, intensification, socialisation, democratisation of access

Additional case studies of technologies related to physical activity (6/6)

Case Study	Type of Technology	Description of technology and impacts
Tonal (https://www.tonal.com/)	Smart equipment	Wall-mounted home gym system that uses digital weights and offers guided workouts through a touchscreen interface Mechanism(s): Personalisation, democratisation of access, democratisation of time
Zombies, Run! (www.sixtostart.com/)	Active esports	AR running game that motivates users with a narrative where they outrun zombies to survive Mechanism(s): Gamification, intensification
Beat the Streets (www.movemoresheffield.com/beatthestreet)	Campaign	Gamified city-wide physical activity intervention that incentivises active travel Mechanism(s): Gamification

Extensive consultations were conducted to understand rangatahi and technology landscape

Name	Date	Role	Area of review
Brent Sheldrake	16 Aug 2023	Regional Partnerships Manager – Sport NZ	Technology & rangatahi participation
Roger Wood	16 Aug 2023	Rangatahi Lead – Sport NZ	Technology & rangatahi participation
Amie Kendall	16 Aug 2023	Knowledge Hub Consultant – Sport NZ	Technology & rangatahi participation
Paul Heron	16 Aug 2023	Relationship Manager – Sport NZ	Technology & rangatahi participation
David Fa'atafa	16 Aug 2023	Project & Sport Manager – College Sport Wellington	Technology & rangatahi participation
Loren Howson	16 Aug 2023	Research and Insights Lead – Sport NZ	Technology & rangatahi participation
Chloe Bishop	16 Aug 2023	Active Recreation Consultant – Sport NZ	Technology & rangatahi participation
Olivia Panakera	22 Aug 2023	Grad Programme 2023-24 – Sport NZ	Technology & rangatahi participation
Luciana Garcia	24 Aug 2023	Diversity, Equity, and Inclusion Manager – Sport NZ	DEI; Women and girls sport; Priority communities

Extensive consultations were conducted to understand rangatahi and technology landscape

Name	Date	Role	Area of Review
Genesis Youth Trust	23 Aug 2023	High risk and High Depriavtion community work in South Auckland	Barriers to access for technology in youth
Auckland Blues Charitable Trust	22 Aug 2023	Community engagement through Sport in Auckland	Barriers to access for technology in youth
GSIC	25 Aug 2023	Global Sports Innovation Centre, Powered by Microsoft	Review of technology categorizations and identification of additional use cases
AcadArena	25 Aug 2023	Esport for Education Provider, focused on youth in USA and MEA	Review of categorization of Esports and implications on youth
ASTN	17 Aug 2023	Australian Sports Technologies Network, a globally leading think-tank and investor in sports technology	Identification and classification of use cases and technology implications

Key findings from stakeholder consultations

Category

Key findings

Drivers for rangatahi participation

- The technology and activities rangatahi do are heavily shaped by what their peers are doing.
- Rangatahi have a preference for physical activity that are time-flexible and that allows them to express themselves.
- Personalisation is key to engagement with youths – no "cookie-cutter" approaches, making it more relatable to the individual.
- For priority groups, access is generally the greatest barrier to physical activity participation with more urban communities typically having easier access.
- 98% of youths have access to phones and internet, therefore there is a need to increase accessibility to accommodate those who don't have access.
- Barriers that impact disabled populations revolve around access – due to needing transport and family to participate, or in needing specialized equipment.
- Girls, Asian and Pasifika communities are also heavily influenced by familial or societal expectations encouraging them not to prioritise physical activity.

Technology behaviours of rangatahi

- Youths respond better to technologies that can be accessed across various devices and/or platforms.
- Crucial for the technology to be pushed to youths constantly.
- Large proportion of rangatahi are on TikTok which provides short-form, easy to digest content that is easily shared amongst peer group.
- More expensive technologies such as smart equipment and smart watches are more relevant for higher access communities.

Other key takeaways

- Some considerations to use technologies to impact intermediaries to youth participation (e.g., teachers, coaches, parents), educating them to enable youth participation.
- Implementation of technology for rangatahi engagement would require top-down approach, however, key decision-makers currently do not have clear understanding of how and what technology to use.

Socialisation reduces barriers of no one to play with, and intensification increases enjoyment

Mechanism	Motivators impacted	Barriers impacted
Socialisation	I like the sport I like being active I have fun I like to win I can prepare for event / competition I can meet new people I can do activity with friends I can do activity with family I can fit in with social circle	I have no friends or family interested in playing My friends or family are not free at the same time I don't have a way to meet up with friends I am not interested I lack the confidence to participate
Intensification	I like the sport I like being active I have fun It improves my physical health It improves my mental health It helps me lose weight	

Democratisation reduces barriers of knowledge, access and affordability…

Mechanism	Motivators impacted	Barriers impacted
Democratisation (Knowledge)	I develop sport skills I develop life skills I can be more like my role model I can prepare for event/competition It improves my physical health It helps me lose weight	I am not intersted I lack confidence to participate There are no coaches for my sport I can't find information online Coaches are fully booked I don't like my coach My parents / friends don't want me to participate
Democratisation (Access)	I have access to school facilities I have convenient access to facility	I am not interested It is too far away It is inconvenient via transport It is fully booked There is no facility for my preferred sport There is bad weather I don't feel safe
Democratisation (Affordability)		Accessing the facility is too expensive Transport to the facility is too expensive Programmes or coaching are too expensive Equipment and apparel is too expensive

…and reduces barriers of time and ability

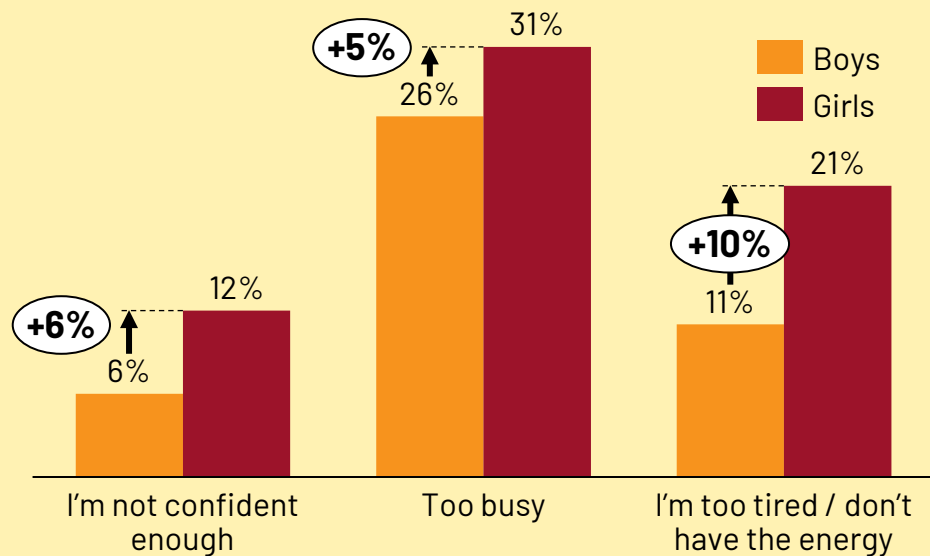| Mechanism	Motivators impacted	Barriers impacted
Democratisation (Time)		It is too far away I am too busy with school / family commitments Physical activity is low on my priorities
Democratisation (Ability)	I develop life skills I develop sport skills It improves my physical health	I have a physical disability I have a physical injury I lack the energy to participate I am not fit enough to participate I don't want to fail My parents / friends don't want me to participate

Biggest barrier gaps between boys & girls, and youth that do and do not have a disability

Proportion of overall youth subgroups that indicate the following as barriers to their PA
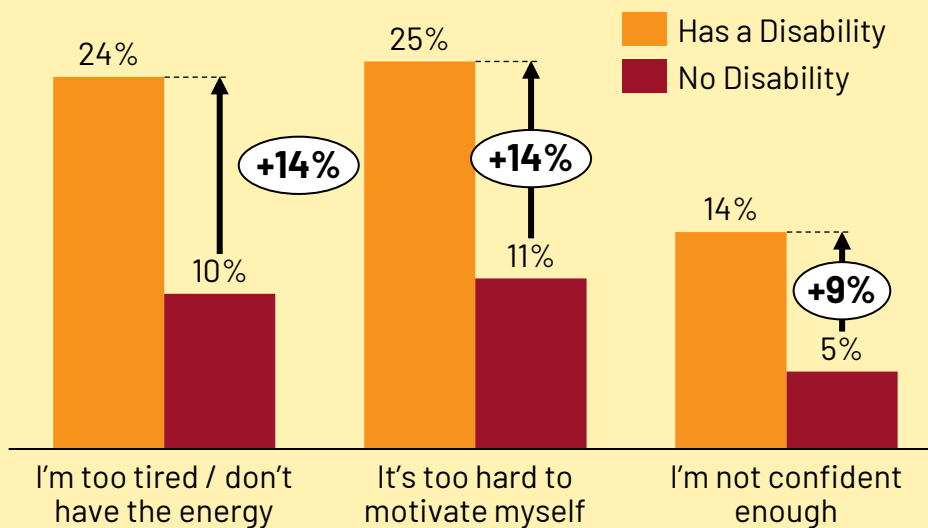
NOT EXHAUSTIVE

Girls

Confidence, time and energy are key differences in barriers between boys and girls in NZ.

Legend: ■ Boys ■ Girls

- I'm not confident enough: Boys 6%, Girls 12% (+6%)
- Too busy: Boys 26%, Girls 31% (+5%)
- I'm too tired / don't have the energy: Boys 11%, Girls 21% (+10%)

Disabled

Energy, motivation and confidence are key difference between youth with and without disabilities.

Legend: ■ Has a Disability ■ No Disability

- I'm too tired / don't have the energy: Has a Disability 24%, No Disability 10% (+14%)
- It's too hard to motivate myself: Has a Disability 25%, No Disability 11% (+14%)
- I'm not confident enough: Has a Disability 14%, No Disability 5% (+9%)

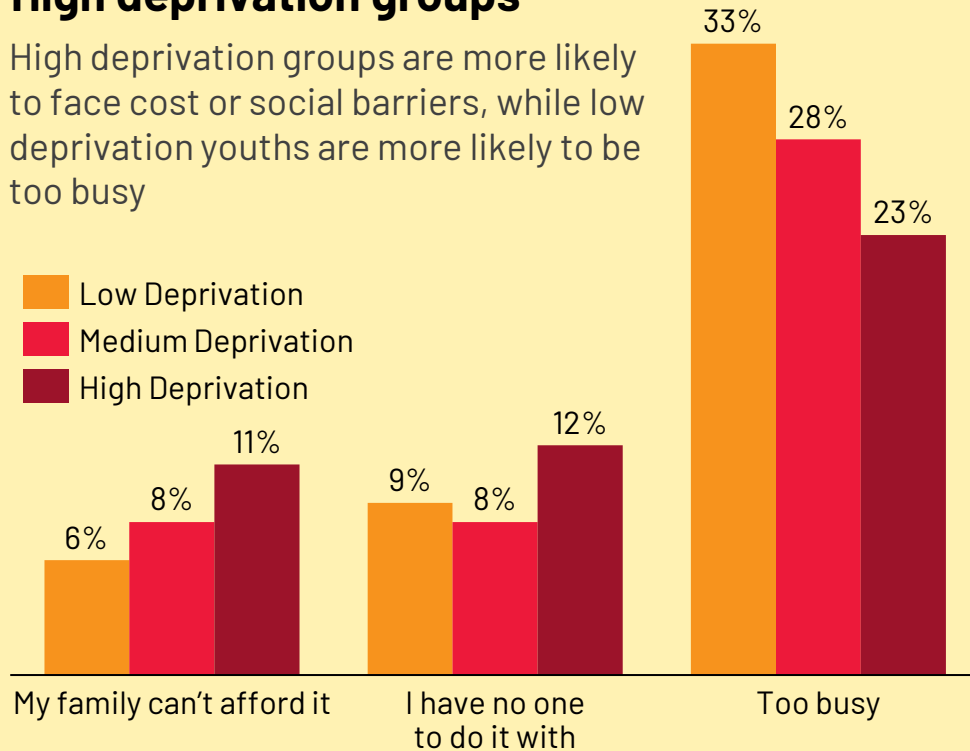# Biggest barrier gaps between different deprivation groups and ethnicity groups

Proportion of overall youth subgroups that indicate the following as barriers to their PA

NOT EXHAUSTIVE

High deprivation groups

High deprivation groups are more likely to face cost or social barriers, while low deprivation youths are more likely to be too busy
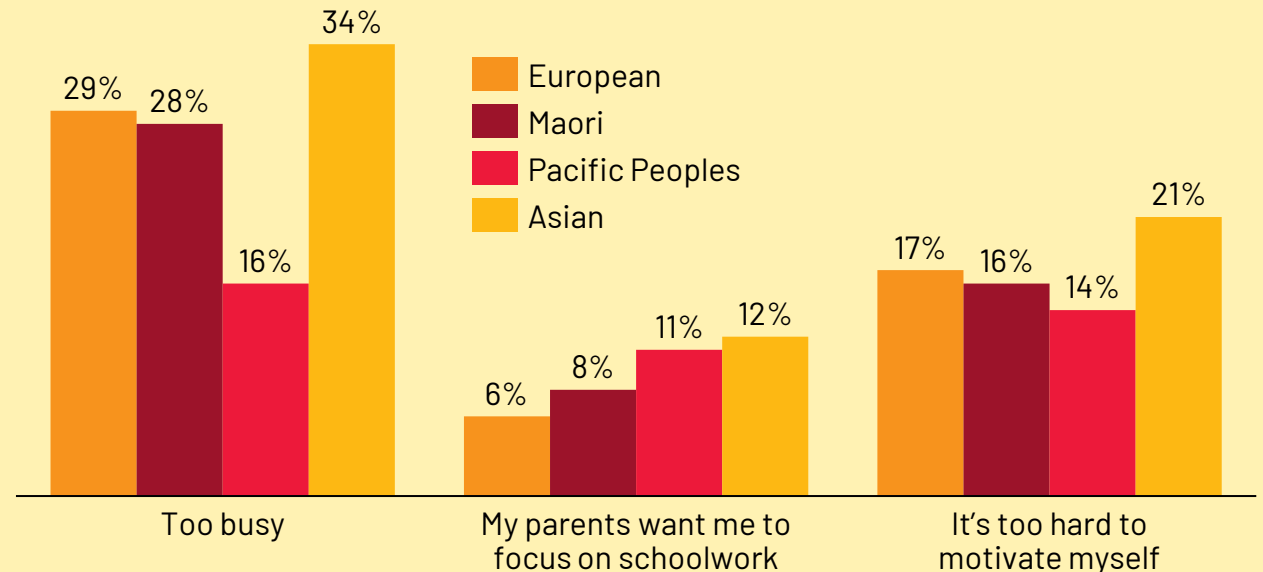
Legend:
- Low Deprivation
- Medium Deprivation
- High Deprivation

Chart data:
- My family can't afford it: 6%, 8%, 11%
- I have no one to do it with: 9%, 8%, 12%
- Too busy: 33%, 28%, 23%

Ethnicity (Asian, Maori, and Pasifika)

Asian groups are more likely than any other group to be too busy, lack motivation and parents who want them to focus on schoolwork.

Legend:
- European
- Maori
- Pacific Peoples
- Asian

Chart data:
- Too busy: 29%, 28%, 16%, 34%
- My parents want me to focus on schoolwork: 6%, 8%, 11%, 12%
- It's too hard to motivate myself: 17%, 16%, 14%, 21%

Current Use of Technology in Physical Activity in youth in NZ

Change in use of technology from 2017 – 2022
(all youths – 5-17 year old)

Increased use of technology could be attributed to impacts from pandemic lockdowns on schooling and social activities.

+16%

35%

19%

2017   2022
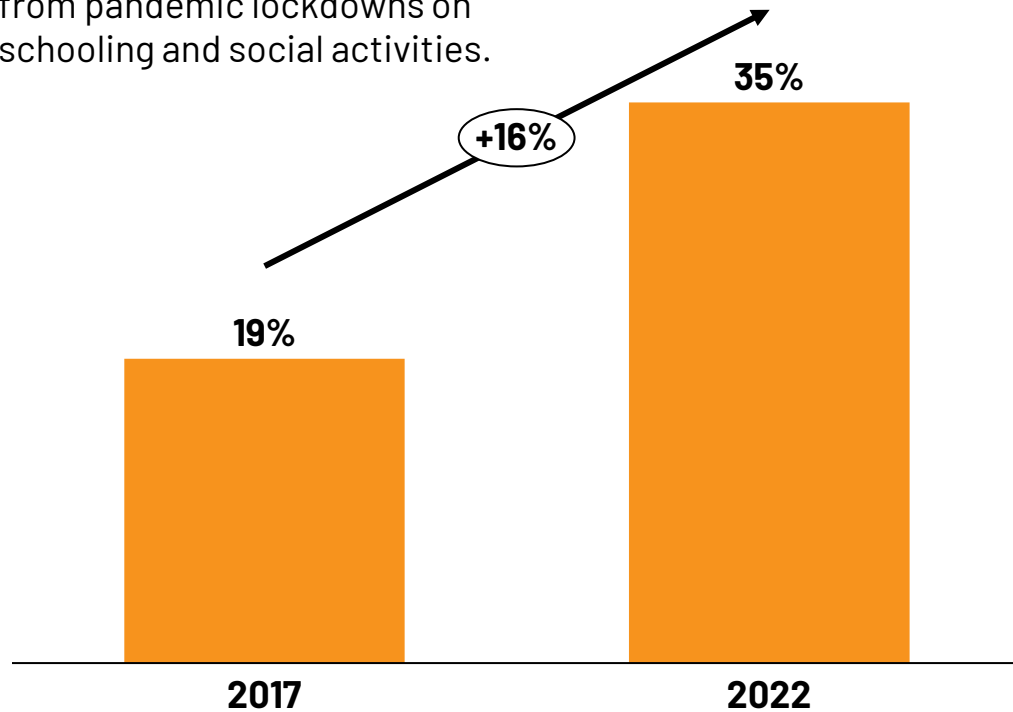
Prefer electronic games over real life games
(all youths – 5-17 year old)

33

24

23

22

20

35%

30%

25%

20%

15%

2017   2018   2019   2020   2021   2022