Developing, Co-Designing and Testing a New Approach in Digital Mental Health for Young Adolescents: *Match Emoji*, a Casual Video Game Adapted for Mental Health and Well-Being

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Abstract

Background

Although mental health and well-being treatments for adolescents exist, many who would benefit from these supports do not access them due to attitudinal and structural barriers, including stigma and cost. Digital mental health interventions address some of these barriers but have often had poor reach and retention in real-world settings. In this research, I explore a new mechanism that has received little attention to date. Specifically, I examined the potential of casual video games to enhance mental health and well-being among young adolescents. I undertook a stepwise series of studies exploring existing literature, establishing interest from young adolescents and adult stakeholders, and developing and testing *Match Emoji*, a casual video game adapted to enhance mental health and well-being.

Methods

1. A systematic review of peer-reviewed literature published between 2009 to 2020 was carried out on the effects of casual video games on anxiety, depression, stress, and low mood.

2. An exploratory study using focus groups, workshops and brief presentations followed by open text forms was completed with young adolescents (13-to-15-years-olds) attending one of seven local primary or secondary schools.

3. Teachers and health professionals, including psychologists, social workers, and counsellors from across New Zealand, took part in an anonymous online survey to explore their opinions on adolescent mental health, digital mental health interventions and casual video games.

4. The development and design of *Match Emoji*, a casual video game adapted to enhance mental health and well-being, was documented.

5. A pilot study of *Match Emoji* was carried out with young adolescents (12-to-15-years-olds) from two New Zealand secondary schools and one intermediate school. Pre- and post-intervention mental health and well-being measures (Child and Adolescent Mindfulness Measure, General Help-Seeking Questionnaire, Flourishing Scale and Revised Children's Anxiety and Depression Scale) and semi-structured interviews were used to estimate the acceptability and therapeutic potential of *Match Emoji*.

Results

From the 13 studies identified in the systematic literature review, 12 reported promising effects of casual video games on anxiety, depression, stress, and low mood (**Study One**). Among the 207 young adolescents who participated in the focus groups, workshops, and presentations, 91% reported playing casual video games at least once a week. Many participants reported playing these games to relieve stress, feel relaxed and become less bored. Overall, most participants were interested in the idea of casual video games adapted for mental health and well-being purposes and provided key recommendations, such as including brief mental health content, appealing colours and engaging game mechanisms (**Study Two**). In total, 98 teachers and health professionals took part in the online survey. Many participants shared similar views about the advantages of using digital mental health tools, including improving young people's access to mental health supports. A small number of participants were cautious about digital approaches, including using CVGs to deliver mental health and well-being content. However, given the importance of adolescent mental health, participants were open to novel ideas to address this challenge (**Study Three**). Among the 45 young adolescents who participated in a pilot study of *Match Emoji,* 71% (32/45) of participants reported playing the game after an 8-week follow-up, and participants reported some therapeutic benefits across the assessments after the completion of the study, with a significant difference found on the RCADS (P=.049) (**Study Four**).

Conclusion

A casual video game adapted to deliver mental health and well-being messaging represents a promising approach to support young adolescents' psychological well-being. It is important to explore the affordances of casual video games and exploit target-users current technology strategies.

Acknowledgements

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List of Abbreviations

ACT= Acceptance and Commitment Therapy

CAMM= Child and Adolescent Mindfulness Measure

CBT= Cognitive Behavioural Therapy

CCBT=Computerised Cognitive Behavioural Therapy

CVG = Casual Video Game

DMHI= Digital Mental Health Intervention

FS = Flourishing Scale

GHSQ = General Health-Seeking Questionnaire

WHO= World Health Organisation

RCADS= Revised Children's Anxiety and Depression Scale

RCT= Randomised Control Trial

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Terms

Adolescence: A period of development that typically corresponds with those between 10-19 years of age. This developmental stage often begins with biological maturation and ends when one achieves a self-sufficient state of adulthood as defined by society.

Casual Video Game: A video game that is fun, entertaining, quick to access, easy to learn, and requires no previous video game skills or regular time commitment to play. These games are often played on mobile phones and involve simple, repeated actions.

Digital Mental Health Intervention: Specialised content, information, support, or therapy for mental health conditions delivered through an electronic method with the aim of treating, alleviating, or managing symptoms.

Young Adolescents: Refers to those adolescents aged between 10 to 15 years of age. The specific cut off for this age group is discussed in the thesis.

Serious Game: Serious games seek to use the popularity of gaming for non-game purposes. For example, a game that encourages learning or promotes behaviour change.

Psychological Distress: The unique discomforting, emotional state experienced by an individual in response to a specific stressor or demand that results in harm, either temporary or permanent, to the person.

Psychological Well-being: A combination of positive affective states such as happiness and functioning effectively in individual and social life.

Match Emoji: A casual video game adapted to deliver mental health and well-being concepts.

A Note on Language

The population of interest for this thesis is 'young adolescents'. The exact definition of young adolescents is the cause for some disagreement in the literature. However, for the purposes of this thesis, I refer to young adolescents as those between 10-15 years of age. In addition, the term 'casual video game' frequently occurs throughout the thesis. While I define casual video games in Chapter Two, casual video games can be defined as games that require little to no previous skills, can be played for short amounts of time and are designed to be fun. Lastly, it is important to note that 'anxiety' and 'depression' are both diagnostic terms for conceptualising a specific cluster of symptoms that impacts daily functioning. In comparison, 'symptoms of anxiety' and 'symptoms of depression' are less intensive or persistent in nature. These symptoms may still be problematic for the individual but do not meet the pre-defined criteria for a diagnosis. Although these sets of terms differ, researchers use these terms interchangeably and therefore; there is some overlap within the thesis.

Publications and Presentations

Publications Featuring in this Thesis

Pine, R., Fleming, T., McCallum, S., & Sutcliffe, K. (2020). The effects of casual video games on anxiety, depression, stress, and low mood: A systematic review. Games for Health, 9(4), 255–264. https://doi.org/10.1089/g4h.2019.0132	Chapter Four
Pine, R., Sutcliffe, K., McCallum, S., & Fleming, T. (2020). Young adolescents' interest in a mental health casual video game. Digital Health, 6, 205520762094939–205520762 0949391. https://doi.org/10.1177/2055207620949391	Chapter Five
Pine, R. (2020). Teachers' and health professionals' attitudes towards adolescent mental health and digital mental health interventions. Advances in Mental Health, 1–11. https://doi.org/10.1080/18387357.2020.1814160	Chapter Six
Pine, R., Te Morenga L., Olson, M., Fleming, T., (2021). Development of a casual video game (*Match Emoji*) with psychological well-being concepts for young adolescents. Digital Health, https://doi.org/10.1177/20552076211047802	Chapter Seven
Pine, R., Mbinta, J., Te Morenga, L., & Fleming T., (2021). A casual video game with psychological well-being concepts for young adolescents: Protocol for an acceptability and feasibility study. JMIR Research Protocols, 10(8), e31588–e31588. https://doi.org/10.2196/31588	Chapter Eight: Part One

Conference Proceedings and Additional publications

Fleming, T., Sutcliffe, K., File, A., Anslow., McCallum, S., & **Pine, R**. (February 2019) Minigames for Micro-Moments in Mental Health. Oral presentation at International Society for Research on Internet Interventions (ISRII) Auckland, New Zealand

Pine, R. (November 2019) A Causal Video Game with Mental Health Concepts. Oral pre at the 7th at Congress of Anxiety and Depression Conference, Brisbane, Australia

Pine, R. (December 2019). A Causal Video Game with Mental Health Concepts. Poster presented at the Society for Mental Health Research (SMHR) Conference, Melbourne, Australia

Pine, R. (January 2020). Digital Mental Health Tools. Oral presentation at 12th Educational Psychology Forum, Massey University, Palmerston North, New Zealand

Pine, R. (2020). Your life, your way: acceptance and commitment therapy skills to help teens manage emotions and build resilience: by Joseph V. Ciarrochi (Author), Louise L. Hayes (Author), Katharine Hall (Illustrator), Oakland, Instant Help Publications, 2020. Advances in Mental Health, 1–2. https://doi.org/10.1080/18387357.2020.1860691

Fleming, T., Sutcliffe, S., Mathijs, L., **Pine, R**., Liesje, D. (2020). Serious Games and Gamification in Clinical Psychology. In Reference Module in Neuroscience and Biobehavioral Psychology. https://doi.org/10.1016/B978-0-12-818697-8.00011-X

Chapter One: Introduction

In this chapter, I begin by locating the research in relation to my experience as an educational psychologist and the literature that highlights the persistent level of unmet health needs among young adolescents in New Zealand. I then discuss the research questions and the theoretical approach underpinning this research. I finish the chapter by providing an overview of the thesis.

The Context for the Research

In this research, I explore the potential of a new approach towards supporting psychological well-being in young adolescents. Psychological well-being approaches are needed as adolescents have high unmet mental health needs that impact their current and future well-being in profound ways (Peiris-John et al., 2020; Sheppard et al., 2018).

Based firstly, on my experience as a practising educational psychologist, and, secondly, on the research, I have noted a lack of scalable and engaging approaches to promoting psychological well-being for those entering adolescence. Research suggests that current treatments and mental health promotion activities appear to have limited reach and appeal for the target population (Kobau et al., 2011; Lee et al., 2013; World Health Organisation, 2014).

In this research, I have explored a novel approach based on casual video games (CVGs) with mental health and well-being content. The research builds upon evidence and theory centred on digital mental health interventions (DMHIs). Digital tools are scalable and practical approaches for many young people who require support for their mental health and well-being; however, such tools are generally underused. Several explanations for this situation exist, including the lack of fit with how people currently use technology (Torous & Roberts, 2017). CVGs, on the other hand, are played widely (Stastica, 2021). People report high levels of satisfaction from playing these games across demographics (Reinecke, 2009). Although recent research suggests CVGs may unintentionally use therapeutic mechanisms of change to support mental health and reduce psychological distress (Fish et al., 2018; Russoniello et al., 2019), this is not fully understood.

I do not suggest that this new approach is a treatment or replacement for other options. Instead, I explored the potential of CVG mechanisms by examining the literature (Chapter Four), seeking target users and expert views (Chapter Five and Six) and creating and testing a CVG with psychological well-being concepts known as *Match Emoji* (Chapter Seven). I articulate

the unique development process of this in Chapter Seven. Given that these processes and phases of research had suggested promise, I tested *Match Emoji* in an acceptability and feasibility study with young adolescents (Chapter Eight).

At the onset of the research, I consulted with Terry Fleming, one of the creators of *SPARX*, a computerised cognitive behavioural therapy (CCBT) game for adolescents (Fleming et al., 2013). Fleming discussed the mechanisms underpinning *SPARX* and the international research that supports the programme's effectiveness for reducing depression. Although research and engagement had been promising in research settings, Fleming believed that the real-world uptake with *SPARX* to date has been disappointing. Fleming and I discussed the potential of a new user-centred approach that capitalises on what young people are already using to address some of these shortcomings. Fleming, McCallum, and other researchers had envisioned a CVG based approach and developed a very simple prototype with Victoria University of Wellington Digital Futures Funding.

Following the simple prototype, I reviewed the literature, concluded that this was indeed worthy of further consideration and enrolled in the PhD. I wanted to capitalise on how young adolescents are currently using the internet for well-being purposes. This exploration led to understanding if CVGs with mental health content might offer an engaging and user-centred approach for supporting adolescents' psychological well-being. I aimed to rigorously examine the therapeutic potential of CVGs with mental health content through a series of coherent studies.

<u>Research Questions</u>

In this research, I undertook a series of four stepwise studies to investigate a new approach in supporting psychological well-being in young adolescents. As there has been a lack of research exploring the therapeutic potential of CVGs, I carried out a systematic review to understand the research around this new mechanism for change. Findings from the systematic review supported the development of a study to investigate young adolescents' attitudes on CVGs for mental health and well-being purposes. Building upon these findings, health professionals and teachers were surveyed and provided their perspectives on adolescent mental health, DMHIs and CVGs. Research findings from the first three studies shaped the development of the specific CVG prototype adapted to deliver mental health and well-being content (*Match Emoji*). In the final phase of research, I conducted a pilot study of *Match Emoji* with 45 young adolescents in the Wellington region of New Zealand.

The key questions which underpin this research are:

1. What are the effects of CVGs on anxiety, depression, stress, and low mood?
2. What are young adolescents' attitudes towards casual video games adapted for mental health and well-being purposes?
3. What are teachers' and health professionals' perspectives on adolescent mental health and digital mental health interventions?
4. What is the acceptability, feasibility of the research process and potential therapeutic capacity of a casual video game prototype (*Match Emoji*) for delivering mental health and well-being concepts among young adolescents?

<u>Theoretical Approach</u>

While I briefly explain the theoretical approach in this section, each chapter that reports the corresponding research text identifies the rationale, data collection process, methods of analysis, and limitations. The chapters also discuss how the findings from each study have been integrated into the overall approach. I also provide a more detailed account of the methodology in Chapter Three.

I have used a post-positivist paradigm with a mixed-methods approach for the current research. A post-positivist paradigm uses scientific methods and contextual understandings to make sense of human experience (Ryan, 2006). Although precise methods still play an essential role in this research, I place greater importance on exploring the context through multiple processes rather than those typically adopted with traditional objectivist methods (Tanlaka et al., 2019). A mixed-methods approach supplements the post-positivist paradigm as it uses multiple data points to provide a more comprehensive and objective understanding of the research questions (Henderson, 2011). As an educational psychologist, my training and knowledge influenced the research questions and methods. I approached this research in terms of theory (empirical research) and my practice as an educational psychologist.

<u>Overview of Thesis</u>

This thesis is presented in the form of six research texts (five peer-reviewed and published research articles and one research manuscript prepared for submission). Each research text builds upon the previous one(s) and is described in the context of a traditional Literature Review, Methodology and Discussion. There is some repetition between the rationale, the

literature reviewed, and the terms used in each research article. However, some differences between chapters exist, reflecting the development and refining of key ideas throughout the course of the research project. The salient changes are discussed in the preamble before each chapter and also link the findings and ideas together.

In the first chapter (Chapter One), I have introduced the research in relation to my experience working as an educational psychologist in New Zealand and the literature. I have also outlined the research questions and theoretical approach needed to answer these questions.

In Chapter Two, I define key terminology and the target population for this thesis. I review the literature on mental health approaches, including digital mental health interventions. I finish this chapter by discussing the limitations of digital mental health interventions and justify why casual video games might hold promising mechanisms for addressing these challenges.

In Chapter Three, I provide a detailed account of the overall methodology for the thesis. I discuss the post-positivism mixed-method approach and summarise how the four studies are integrated.

In Chapter Four, I present the first study, which involved a systematic review of the literature on the effects of CVGs on anxiety, depression, stress, and low mood:

> **Pine, R**., Fleming, T., McCallum, S. & Sutcliffe, K., (2020). The effects of casual videogames on anxiety, depression, stress, and low mood: A systematic review. *Games for Health Journal*. https://doi.org/10.1089/g4h.2019.0132.

In Chapter Five, I report on the second published study, young adolescents' attitudes on CVGs for mental health and well-being purposes:

> **Pine, R**., Sutcliffe, K., McCallum, S. & Fleming, T., (2020). Young adolescents' interest in a mental health casual video game. *Digital Health Journal*. https://doi.org/10.1177/2055207620949391.

In Chapter Six, I discuss the survey of teachers' and health professionals' attitudes on adolescent mental health and DMHIs:

> **Pine, R.** (2020). Teachers' and health professionals' attitudes towards adolescent mental health and digital mental health interventions. *Advances in Mental Health*. https://doi.org/10.1080/18387357.2020.1814160.

In Chapter Seven, I discuss the process by which I developed a specific CVG prototype (*Match Emoji*):

> **Pine, R**., Te Morenga L., Olson, M., Fleming, T., (2021). Development of a casual video game (*Match Emoji*) with psychological well-being concepts for young adolescents. *Digital Health Journal*. https://doi:10.1177/20552076211047802.

In Chapter Eight, I discuss the protocol and then findings from the pilot study:

> **Pine, R**., Mbinta, J., Te Morenga, L., & Fleming T., (2021). A casual video game with psychological well-being concepts for young adolescents: Protocol for an acceptability and feasibility study. *JMIR Research Protocols*. https://doi.org/10.2196/31588.

> **Pine, R**., Mbinta, J., Te Morenga, L., & Fleming T., (*forthcoming*). A pilot study of a casual video game with psychological well-being concepts (*Match Emoji*) for young adolescents. *JMIR Research.*

Finally, in Chapter Nine, I consider the overall findings and the implications for research and draw conclusions for this research.

Chapter Two: Literature Review

In Chapter One, I discussed my motivation to undertake the PhD. This motivation was based on my experiences working as an educational psychologist with young people in New Zealand. Specifically, I have observed high rates of psychological distress in adolescents transitioning across educational environments. Although mental health approaches, including specialised treatments, are available, not all young people who need support actively seek out help or can access it. Further, due to the diversity of preferences and needs, a combination of scalable and novel tools are required to keep up with the growing mental health needs among young adolescents in New Zealand. As such, in this research, I wanted to explore the potential of a new and real-world mental health approach for young adolescents.

In this chapter, I introduce and define the target population for this research and review and critique the literature related to mental health and digital mental health approaches. This chapter consists of three parts:

- In *Part One*, 'Young Adolescents' Mental Health in New Zealand', I define and discuss the target population for this research. I then discuss mental health and well-being terminology and cultural perspectives. I conclude by discussing the growing mental health needs among young adolescents in New Zealand.
- In *Part Two*, 'Mental Health Approaches', I review and critique the literature concerning specialised mental health treatments, early interventions, preventative programmes, and psychological well-being interventions for adolescents.
- In *Part Three*, 'Digital Mental Health Interventions', I discuss how digital mental health interventions are a relatively new approach for meeting young adolescents' mental health needs. Specifically, I discuss the research concerning two types of digital mental health interventions, mental health apps and serious games. I then discuss the limitations of these approaches and propose how casual video game mechanisms and mental health messaging might represent a promising approach to address these challenges.

Part One: Young Adolescents' Mental Health in New Zealand

Adolescence

Since the early 1990s, researchers have tried to define the exact onset and conclusion of adolescence (Hall, 1904; World Health Organisation, 2014). Most researchers have generally agreed that puberty corresponds with the start of adolescence, while the attainment of adult roles marks the conclusion (Blum, 2020; Caskey & Anfara, 2007). However, even these criteria have caused debate as many individuals in less developed countries experience puberty and are assigned adult responsibilities earlier than their peers in more developed countries (World Health Organisation, 2017; Gibbons & Poelker, 2019). Moreover, in some cultures, the start of adolescence for girls is signalled by the first menstrual period, whereas, for males, it coincides with the first growth spurt (Blum, 2020; Lansford et al., 2021). Thus, adolescence is a dynamically evolving construct embedded in and defined by culture.

Although adolescence varies widely across cultures and over time, it can be conceptualised as a profound period of development that typically corresponds between the ages of 10-19 (Gibbons & Poelker, 2019; Mills et al., 2014). Significant developmental and behavioural changes emerge during adolescence, including growth spurts, risk-seeking behaviour and increased sensitivity to social roles, social status, and social cues (Sawyer et al., 2018). At the same time, the brain undergoes rapid changes concerning the expansion of specific brain regions and the connectivity between brain cells. The surge in brain growth during the onset of adolescence is made possible by an abundance of specialised brain cells (Spear, 2013). Some of these cells are used to strengthen the connectivity between brain regions and are retained, while other cells that fail to make successful connections are lost and removed. The process where excessive brain cells are removed is referred to as pruning and is highly pronounced during adolescence (Blakemore & Choudhury, 2006). In essence, pruning helps remove the connections in the brain that are no longer needed, which in turn increases the capacity for brain growth and creates possibilities for adolescents to develop new neural pathways (Forbes & Dahl, 2010; Steinberg, 2008).

While plasticity in the brain has many adaptive advantages, including facilitating the learning process, environmental and biological factors play major and overlapping roles in shaping this malleable period of development (Baselmans et al., 2019; Zucker et al., 2018). For instance, early life stressors, such as child abuse or domestic violence, are more salient when the brain is still developing and can increase the likelihood of developing adverse outcomes such as depression or aggressive behaviours (Nugent et al., 2011). In a similar way, longitudinal twin

studies have shown the important role genetics play in predisposing adolescents to negative outcomes (Nugent et al., 2011; Taylor et al., 2015). The combination and interaction of these complex factors can compound the likelihood of adolescents developing mental distress and disorders later in life (Kessler et al., 2005). Whether environmental or genetic factors are more critical for explaining the relationship between mental health and psychological distress in adolescents is not the focus of this research. Instead, it is crucial to understand that vulnerabilities for developing elevated levels of mental distress are plentiful during adolescence (Steinberg, 2008). While treatment and prevention programmes can profoundly reduce the chances of developing mental disorders later in life (Kuosmanen et al., 2017; Spirito et al., 2011), there are several barriers to accessing and receiving this support, such as stigma, cost, and geographical isolation (Velasco et al., 2020).

Young Adolescents in New Zealand

Adolescence is clearly a unique and fluid period of development that corresponds with dramatic physical and biological changes (Mills et al., 2014). Because this development period is complex, researchers have struggled to develop standardised or exclusive criteria for conceptualising the different stages between the years from 10-19 (Baselmans et al., 2019). Instead, broad and often interchangeable terminology is used in the literature when referring to sub-populations of adolescents. For example, the global early adolescent study (GEAS) is a series of international studies that aim to understand how gender norms and health outcomes evolve specifically among young adolescents. Researchers involved in the GEAS define young adolescents as between 10-15 (Mmari et al., 2017). To a similar extent, The World Health Organisation (2014) refer to early adolescence as those aged between 10-14, older adolescents as those 15-19 and youth as those aged 10-24 (The World Health Organisation, 2014). While these definitions and terms vary, there is a general consensus that age is the easiest way to separate young adolescents and older adolescents. Therefore, this section discusses the sub-population of adolescents this research is concerned with; adolescents aged 10-15, hereafter 'young adolescents' in New Zealand.

Young adolescents contribute a significant proportion of the population in New Zealand. According to the latest national survey from Statistics New Zealand (2018), 305,847 young adolescents live in New Zealand, equivalent to 6.5% of the total population (Statistics New Zealand, 2018). Most young adolescents in New Zealand identify as New Zealand/European, 68.7%, while 26% identify as Māori, 13.2% Pacific Island and 13.3% Asian (Table 1). Males make up 51.1% of young adolescents, while 48.9% identify as female. As seen in Table 1, the

total population of young adolescents has been relatively consistent from 2006 to 2018. However, it is important to note that the gender split is unlikely to account for trans young adolescents and does not include non-binary young adolescents.

Table 1

Demographics of Young Adolescents in New Zealand

Population	Source and year	Total	Sex		Māori	Pacific Island	Ethnicity NZ/ European	Asian
			Male	Female				
Young Adolescents (10-15 years)	Stats NZ 2018	305,847	156,405	149,442	79,758	40,371	210,216	40,707
Young Adolescents	Stats NZ 2013	286,830	146,637	140,157	64,101	33,129	192,372	30,468
Young Adolescents	Stats NZ 2006	306,009	157,113	148,893	66,726	31,899	189,570	27,987

Note: Adapted http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode. Copyright 2018 by Statistics New Zealand. Reprinted with permission.

The most common ethnicities among young adolescents in New Zealand are Māori and European (Pākehā). These two ethnicities are diverse in their cultural values, beliefs, and customs (Lansford et al., 2021). For example, in Māori culture, there is often greater importance placed on whānau (family), reo (language), whakapapa (genealogy), and whakawhanaungatanga (inter-related connections and links) (Matika et al., 2021). Thus, adolescents who identify as Māori may spend more time with extended whānau, engage in cultural traditions or solve problems collaboratively (Edwards et al., 2007). Importantly, colonisation has led to an overabundance of negative consequences for Māori (Moewaka Barnes & McCreanor, 2019). Ultimately, for generations, colonisation has exacerbated inequities in health, well-being and other important domains for Māori, leading to many ramifications, including less access to resources and higher rates of psychological distress (Williams et al., 2018). In contrast, Pākehā culture tends to prioritise independence and autonomy (Huygens et al., 1998). Without entering into a discussion about the similarities and differences between cultures in New Zealand, it should be noted that young adolescents in New

Zealand grow up in diverse cultures, and their behaviour, values and relationships cannot be understood independently (Lansford et al., 2021).

Turning to the rapid biological changes for young adolescents, continued improvements in imaging technologies have made it possible for researchers to study the size and the connectivity of brain regions during human development (Caskey & Anfara, 2007). Findings from research studies using imaging technology methods suggest central and frontal parts of the brain responsible for threat appraisal and self-control are not yet fully developed for young adolescents (Chu et al., 2022; Nyongesa et al., 2019). Consequently, some of the implications for this population include but are not limited to becoming more prone to misinterpreting stimuli as threatening (Onetti et al. 2019), experiencing difficulties switching between tasks (Nyongesa et al., 2019), and engaging in more risk-seeking behaviours (Gutman & Eccles, 2007). Not surprisingly, these unique implications can increase the vulnerability of developing psychological distress and disorders, particularly among those individuals beginning adolescence (Kessler, 2008; Onetti et al., 2019).

For young adolescents undergoing multiple developmental and biological transformations, the transition across educational systems can present additional complications, facilitating growth for some and creating challenges for others (Blum et al., 2020). Educational transitions for young adolescents in New Zealand, including those from primary to intermediate and secondary school or to alternative schooling facilities such as Activity Centres, Health Schools and Te Kura (formerly known as Correspondence School; Ministry of Education, 2017), correspond with a plethora of adjustments such as bigger class sizes and an increased level of autonomy for learners (Mmari et al., 2017). A substantial amount of research has shown that successfully adapting to new educational environments can improve self-efficacy (Madjar & Chohat, 2016) and enhance positive well-being (Jindal-Snape et al., 2021). In contrast, researchers have also argued that educational transitions can be disruptive, negatively impacting young people's psychological well-being (Poorthuis et al., 2014), leading to higher dropout rates (McIntosh et al., 2008), and indirectly increasing anxiety (Peters & Brooks, 2016). These transitions can be especially problematic for some young adolescents who have additional challenges, such as those with autism spectrum disorders, due to the lack of structure in larger environments (Mandy et al., 2016; Tso & Strnadova, 2017).

Theoretical Framework

While biological and environmental factors are essential to consider for educational and well-being outcomes, it is just as important to refer to well-established frameworks that conceptualise the role broader factors play on human development. Bronfenbrenner's ecological model (1977) is among the most widely used frameworks highlighting the multiple structures and contexts that impact human development. The nested set of systems includes proximal factors such as family, school, peer influences and also includes broader societal factors such as policies. As seen in Figure 1, the arrows within the ecological model highlight the relationship between each component (Bronfenbrenner, 1977). For example, the 'microsystem' identifies the relationship between the individual and their immediate environment. For young adolescents in New Zealand, this may involve their relationship with caregivers or whānau. However, this relationship begins to change as young adolescents tend to spend more time interacting with peers outside of the home (Blum, 2020). In comparison, the broader 'macrosystem' encompasses the sociocultural context, including policies, laws, political beliefs, and the mass media. Therefore, changes within these systems can indirectly affect a range of other systems, including the individual's development.

Figure 1

Bronfenbrenner's Ecological Model
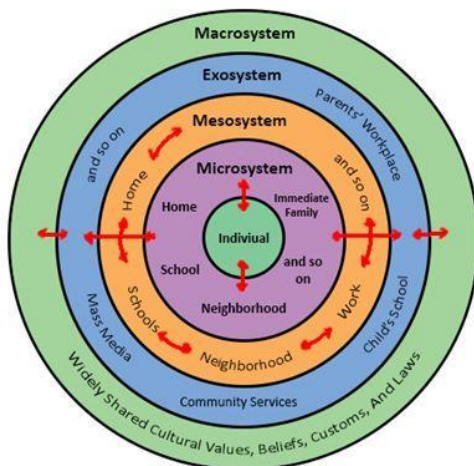
Note. Adapted from N*ature-nurture reconceptualized in developmental perspective: a bioecological model.* Bronfenbrenner U, (1994). *Psychological Review 101* (4): 568–586. In the public domain.

Mental Health, Mental Distress, Mental Disorders and Psychological Well-Being

Before discussing young adolescents' mental health in New Zealand, it is essential to define the different terms related to the broad construct of mental health. This discussion is important

because definitions of mental health, mental distress, mental disorders, and psychological well-being vary across the literature. The lack of consensus on the definitions has consequences for policy decisions, practice, funding, appropriate treatments, and research (Slade, 2010; Rohleder, 2019).

Some definitions of mental health include intellectual, emotional, spiritual (Mental Health Promotion, 2011), and physical health aspects (Bhugra et al., 2013). However, a widely used and accepted definition is from the World Health Organisation (2017) who, refer to **mental health** as:

 "*a state of well-being in which the individual realises his or her own abilities can cope with the normal stresses of life, can work productively and fruitfully and is able to make a contribution to his or her community.* " (The World Health Organisation, 2017).

On the other hand, **mental distress** refers to a broad range of distress, including but not limited to sleep problems, changes in mood, or an imbalance associated with a broader mental health construct such as relationships (Rohleder, 2019). This level of distress may not be severe enough to meet the threshold for assigning a specific diagnostic label but is still problematic for the individual (Rohleder, 2019).

Mental disorders, on the other hand, are defined by the American Psychiatric Association (2013) as:

"*The presence of ongoing emotional or psychological problems which cause risk, harm or distress, are outside normal age expectations and have been assessed and diagnosed by licensed psychologists or psychiatrists*" (American Psychiatric Association, 2013).

This definition indicates that when a specific set of symptoms impact daily functioning, an individual may meet the criteria for a clinical disorder. These labels can help professionals identify the most appropriate treatment for a specific 'problem'. The process of attaching a diagnostic label to a person can have significant implications later in life, such as indirectly causing them to experience stigma (Doucet et al., 2010). Therefore, it is essential to consider different perspectives, variables, and long-term effects when using diagnostic criteria (American Psychiatric Association, 2013).

Psychological well-being is relatively under-explored in mental health research and includes hedonic (enjoyment, pleasure) and eudaimonic (meaning, fulfilment) constructs. Given the broad nature of psychological well-being, it is helpful to unpack the specific processes (Tang

et al., 2019). According to Purtle et al. (2019), psychological well-being is comprised of six key domains: self-acceptance, positive relationships, autonomy, environmental control, purpose and personal growth (Purtle et al., 2019). Each domain plays a pivotal role in promoting optimal functioning and experience (Hayes et al., 2006). Other researchers have expanded on definitions of psychological well-being to include coping skills, emotion regulation, healthy problem solving, a sense of balance in emotions, thoughts, and social relationships (Littlejohns et al., 2019; Ryan & Deci, 2000; Ryff, 1995; Scheid & Brown, 2010). Compared with mental health and ill-health, psychological well-being components are holistic and encompass broad factors that can dynamically influence ones' specific mental state (Tang et al., 2019).

Two main perspectives in the literature can be used to differentiate mental health, mental distress, mental disorders, and psychological well-being. First is the categorical approach. The categorical approach views mental health and mental disorders as a dichotomy. People who experience high enough levels of mental distress and meet the threshold for a diagnosis are given a label to understand their set of symptoms (Doucet et al., 2010). In contrast, those who have a good level of mental health or who experience sub-clinical levels of mental distress do not receive a diagnostic label or specialised mental health support (Granieri et al., 2021). Biomedical theories and explanations underpin this way of supporting mental health. Although this medical paradigm can help identify appropriate treatments based upon a set of symptoms, the focus on distress as disease and (ab)normality neglects individuals who may experience sub-clinical or mild-to-moderate levels of distress.

The continuum approach is a more appropriate framework for this research as it conceptualises mental health and mental distress as two overlapping but distinct constructs along a continuum (Westerhof & Keyes, 2010). For example, as seen in Figure 2, those individuals who are generally happy and satisfied with their well-being can be seen under the healthy category, while those experiencing severe levels of distress lie at the other end of the continuum. Importantly, there is a range of states between these two poles representing the dynamic state of ones' mental health and well-being.

Figure 2

The Mental Health Continuum
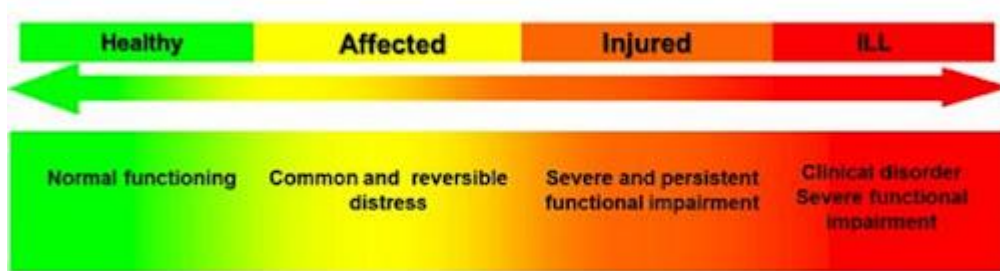
Note: Adapted from *The mental health continuum: From languishing to flourishing in life*. *Journal of Health and Social Behavior* Keyes, C. (2002).*43*(2), 207–222. CC-BY 2.0

<u>**Cultural Perspectives of Mental Health**</u>

Historically, Western cultural traditions and philosophies of mental health have played a dominant role in shaping mainstream mental health perspectives and health care models (Bentall et al., 2014; Vukic & Gregory, 2018). Bentall (2014) suggests Western ways of understanding mental health attribute mental illness to endogenous (internal) factors. For instance, biochemical imbalances in the brain are understood to be the primary cause of psychiatric disorders such as 'schizophrenia' or 'depression' (Bowden et al., 2019). Therefore, in this paradigm, mental distress requires investigation, treatment, and elimination, just as diseases of the body would be treated (Bracken et al., 2016).

In New Zealand, mental health services have typically adopted a Western approach to understanding and treating mental health disorders. Mental health clinicians generally use the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) produced by the American Psychiatric Association (American Psychiatric Association, 2013) to classify individuals' abnormal, impaired, or pathological psychological functioning based on specific criteria. Following a medical diagnosis, medications and/or psychotherapy are often recommended for young people, irrespective of cultural contexts (Littlejohns et al., 2019).

Western approaches to treating mental health in New Zealand are reflected in the growing number of antidepressants prescribed for young people (Bowden et al., 2019). In New Zealand, the total number of annually dispensed medications increased 68%, from 111,171 in 2008 to 186,396 in 2016 (Bowden et al., 2019). This increase may partly be due to adopting Western and biologically focused approaches to understanding and supporting mental health and well-being (Hetrick et al., 2021). That is, mental distress and disorders are thought to be caused by an imbalance in the brain. Disease-specific drugs are subsequently 'needed' to correct these

imbalances. Despite the paradigm adopted, medications such as selective serotonin uptake inhibitors (SSRIs) often yield small reductions in anxiety and depression symptoms among young people (Cobham et al., 2019; Hetrick et al., 2021). Furthermore, SSRIs have been associated with potentially harmful effects (Littlejohns et al., 2019). Adopting a Western approach to understanding and supporting mental health in New Zealand has failed to provide equitable outcomes for Māori and Pasifika adolescents (Ministry of Health, 2016; Durie, 2006). Research conducted among rangatahi (Māori young people) has consistently reported that Māori and Pasifika adolescents experience a disproportional rate of distress and have poorer access to health care compared to adolescents of other ethnicities in New Zealand (Peiris-John et al., 2020).

In contrast to Western mental health approaches, non-Western approaches are typically grounded in more holistic and interconnected constructs. These constructs, including cultural beliefs and systems, play an important role in conceptualising and supporting the complexity of mental health (Durie, 2006). Thus, non-Western approaches generally consider the person rather than their set of symptoms. Although both approaches are fundamentally different, Mcfarlane et al. (2015) propose that both non-Western and Western approaches are needed in research and can be blended to create a more robust approach than either approach can make unilaterally. This process, known as he awa whiria (a braided rivers approach) is not explicitly adopted throughout the entirety of this research. However, Western knowledge and Te Ao Māori principles inform this programme at different stages. Thus, this research programme builds upon and extends both Western and non-Western mental health perspectives to advance the mental health and well-being of young adolescents in New Zealand.

Young Adolescents' Mental Health in New Zealand

International research from the World Health Organisation (2018) suggests, irrespective of the definitions and perspectives, adolescent distress is among the most pressing issues contributing approximately 16% of the global burden of disease and injury. Those young people who live in low socioeconomic status areas and identify with gender and ethnic minorities experience disproportionally higher rates of mental distress than other populations (Moffitt et al., 2011). In the context of New Zealand, similar findings have been reported in cross-sectional health and well-being surveys such as the Youth 2000 series, conducted in 2001, 2007, 2014, and 2019. According to the Youth 2000 studies, youth mental health has worsened over time, with a sharp increase in levels of distress since 2012 (Peiris-John et al., 2020). Notably, the most

recent Youth 19 survey (2019) shows nearly half of young adolescents experience at least some level of mental distress in New Zealand, as seen in Table 2.

Table 2

Young Adolescents' Mental Distress in New Zealand by Age

Total	n (N)	n (N)	n (N)	n (N)
Age	No Mental Distress	Mental Distress	Symptoms of Depression	Symptoms of Anxiety
≤13	704 (1277) (55.1%)	591 (1344) (44%)	286 (1325) (21.6%)	511 (1297) (39.4%)
14	849 (1593) (53.3%)	781 (1677) (46.6%)	401 (1646) (24.4%)	664 (1624) (40.9%)
15	772 (1570) (49.2%)	837 (1645) (50.9%)	443 (1607) (27.6%)	723 (1608) (45%)
Total Percentage	2325 **52.4%**	2209 **47.3%**	1130 **24.7%**	1903 **42%**

Note: Table created from Youth 19 Youth19 Rangatahi Smart Survey, Initial Findings: Hauora Hinengaro / Emotional and Mental Health. The Youth19 Research Group, The University of Auckland and Victoria University of Wellington, New Zealand.

Beyond the 'typical' biological and environmental changes for young adolescents to overcome, the implications of the COVID-19 pandemic and climate change threaten to compound these challenges (Peiris-John et al., 2020; Health Promotion Agency, 2018). The consequences of the pandemic have already resulted in school closures, a lack of social contact, and increased fear and stress related to infection (Cohen et al., 2021). Furthermore, it has become increasingly evident that more young people are worried and uncertain about the sustainability of the future to the point that this unique distress has now been labelled its own type of anxiety, 'eco-anxiety' (Thompson, 2021). Therefore, while young adolescents in New Zealand were an underserved and vulnerable population before the consequences of the COVID-19 pandemic, it is likely that

this population are now at an even higher risk of experiencing negative mental health consequences (Cohen et al., 2021).

<u>Summary</u>

In summary, young adolescents learn to navigate and cope with a range of new situations and complicated feelings, which can present exciting opportunities for growth (Gutman & Eccles, 2007; Larson & Ham, 1993). Although some young adolescents may flourish in these conditions developing new skills and peer relationships, challenges and vulnerabilities may be exacerbated, leading to a cascade of adverse outcomes for others. Some of the consequences for young adolescents include becoming more susceptible to developing adverse outcomes, such as mental health-related problems. Although there is little agreement on a general definition for mental health, let alone similar related terms such as mental distress and psychological well-being, Western models are typically adopted in New Zealand to conceptualise broad constructs and provide support. These models typically focus on treating the biological imbalances in the brain rather than concentrating efforts on understanding cultural, environmental and contextual factors. Nevertheless, it has been well documented that the current paradigm and systems used in New Zealand are not sustainable in their current form to meet the growing mental health needs among young adolescents.

Part Two: Mental Health Approaches

The unique set of challenges that occur during the first five years of adolescence, as well as environmental and contextual challenges, such as the implications of the COVID-19 pandemic and climate change, mean that many young adolescents experience psychological distress (Peiris-John et al., 2020; The World Health Organisation, 2019; Bor et al., 2014). Thus, multiple approaches, including programmes targeted at entire populations and more specialised treatments, are needed to address the complexity and multitude of challenges.

The range of mental health approaches, including universal approaches to promote health through to specialised treatments, can broadly be conceptualised within a tiered system, as seen in Figure 3. Developing and implementing a range of supports has many benefits, such as acknowledging the diversity of mental health needs and helping to distribute resources in an equitable manner (August et al., 2018). In this section, I discuss the range of mental health approaches available in relation to the tiered systems approach. While I try to focus on mental health approaches for young adolescents in this section, much of the literature has studied adolescents as a broad population encompassing those 10-to-19-years of age.

Figure 3

Example of a Tiered Systems Approach to Mental Health
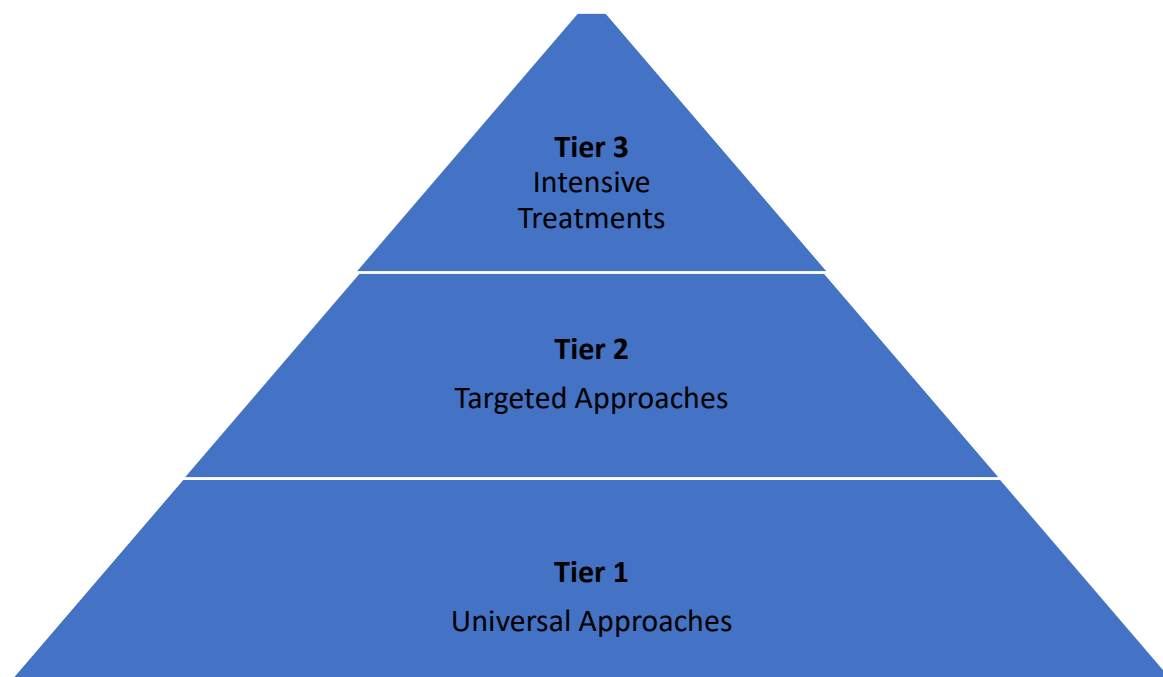
Note. Adapted from *Mental Health in Elite Athletes: Increased Awareness Requires An Early Intervention Framework to Respond to Athlete Needs* by Purcell, R., Gwyther, K. & Rice, SM (2019) *Sports Med - Open 5, 46*. Copyright 2019 Springer Nature. (Purcell et al., 2019).

Specialised Mental Health Treatments

The mainstays of specialised treatments for reducing clinical levels of psychological distress among adolescents are psychotherapies and antidepressant medications (Skehan & Davis, 2017; Te Pou, 2009). In terms of psychotherapies, various approaches are available to reduce psychological distress, including acceptance and commitment therapy (ACT), dialectical behaviour therapy (DBT), and interpersonal therapy (Fordham et al., 2021). These approaches are typically based upon overlapping therapeutic processes such as cognitive and relaxation mechanisms (Locher et al., 2019). Cognitive behavioural therapy (CBT) has remained among the most evidence-based and widely used psychotherapies for reducing distress across the spectrum of mental health disorders (Fordham et al., 2021). Traditional CBT treatment requires weekly 30- to 60-minute sessions over 12 to 20 weeks and ranges from learning skills related to challenging unhelpful thinking patterns to relaxation strategies (Stallard, 2002). When therapists successfully implement these therapeutic techniques, systematic reviews and meta-analyses of CBT consistently demonstrate general efficacy for reducing anxiety and depression, particularly among adult populations (Fordham et al., 2021).

Despite the evidence base of CBT for reducing mental distress, the application of CBT for young adolescents can be more challenging for therapists (Littlejohns et al., 2019; Stallard, 2002). As Stallard (2002) suggests, one of the primary challenges for clinicians is adapting therapeutic techniques to meet the client's developmental needs. Tailoring CBT processes for younger populations is particularly difficult for therapists, given each adolescent's profound and unique developmental challenges. Further, those who have yet to develop a 'competent' level of emotional literacy and awareness skills may struggle even more so to articulate their challenges clearly and engage successfully in therapy (Garber et al., 2016; Schønning et al., 2020; Wenzel, 2017). Therefore, while CBT has shown promising efficacy for reducing psychological distress, clinicians need to spend a considerable amount of time adjusting therapeutic protocols appropriately for younger populations (Littlejohns et al., 2019; Stallard, 2002).

Clinical guidelines recommend combining psychotherapy with medication such as SSRIs and serotonin-norepinephrine reuptake inhibitors (SNRIs; Cipriani et al., 2009) for those experiencing higher levels of mental distress (Littlejohns et al., 2019). However, according to research findings and similar to CBT, medications for reducing psychological distress have

several limitations for young people. First, medications for reducing distress typically show minor effects for improving mood among young people (Hetrick et al., 2021). In particular, a recent meta-review of antidepressants in children and adolescents found placebos have similar and even improved efficacy for reducing mental distress compared with medications apart from fluoxetine (Boaden et al., 2020). Second, antidepressants have been associated with potentially harmful outcomes, such as nausea, headaches and suicidality (Markowitz & Cuellar, 2007). Third, the methods adopted in research studies investigating the effects of medications for reducing anxiety and depression in adolescents, particularly those completed before the 2000s, are of variable quality (Bridge et al., 2007). In a study investigating the effects of the pharmacological drug Amitriptyline in children with Major Depressive Disorder (MDD), Kashani et al. (1985) only recruited a sample of nine children (Kashani & Carlson, 1985). Similar underpowered studies using less than 20 participants have also been completed (e.g. Lopez et al., 1997), limiting the generalisability of these results.

Early Interventions and Preventative Programmes

While specialised treatments for mental health are essential for those experiencing high levels of psychological distress or disorders, several issues with this approach for young people remain, including the need to tailor therapeutic processes and the potential adverse effects of antidepressants (Markowitz & Cuellar, 2007: Stallard, 2002). Moreover, most adolescents with distress remain unable to access these specialised treatments due to a lack of services, or their symptoms are not severe enough (Littlejohns et al., 2019). This reality has left researchers and mental health services worldwide searching for more efficient, scalable, safe, and proactive ways of delivering support (Wang et al., 2007).

A promising combination of approaches that may meet this need is early intervention and preventative programmes. Although the terms overlap and are often interchangeable in the literature, early interventions and preventative programmes aim to reduce the likelihood of developing mental distress later in life (World Health Organisation, 2017). Early interventions are characterised by their broad and timely nature (Gardner, 2018). Typically, these interventions focus on children and adolescents who experience a higher risk of developing a mental health disorder, such as those who live in lower socioeconomic status areas (World Health Organisation, 2017). In a similar light, preventative programmes aim to reduce the incidence, prevalence, and recurrence of mental distress, mental disorders and other disabilities (Arango et al., 2018). Preventive approaches often involve broader populations and range from

strengthening coping skills for individuals to addressing issues such as decreasing poverty, racism, inequality, reducing conflict, war, violence, homophobia and bullying in schools (World Health Organisation, 2017; Ebert et al., 2015). In this way, early interventions and preventative programmes can deliver timely and efficient support to a broad population before mental health needs worsen (Colizzi et al., 2020).

It is widely asserted that early intervention and preventative programmes can positively promote psychological well-being and minimise the impact of developing psychological distress later in life (Alliston, 2007; Ministry of Education, 2010). From an economic perspective, meta-analyses and economic analyses suggest preventative programmes can lead to financial savings, with approximately every $1 spent on preventing psychological distress saving $7 in health care and $30 in productivity costs (Cuijpers et al., 2008; Zechmeister et al., 2008; Le & Mihalopoulos, 2021; Roberts et al., 2011). However, there is significant variability within these types of interventions, with some programmes showing more promising results for improving outcomes than others (Greenberg et al., 1995; Wilson et al., 2001). Furthermore, researchers examining these interventions in trials have used various therapeutic mechanisms, mental health assessments, follow-ups, sample sizes, and methods, limiting the possibility of drawing conclusive and salient themes across the literature. Nevertheless, in the next section, I discuss four relevant preventative and early intervention programmes.

One of the most notable CBT-based preventative programmes for 11-to-18-year-olds is the Multimodal Pathway Toward Healthy Youth Program (EMPATHY) (Silverstone et al., 2017). Although limited information was provided about the development of the programme, Silverstone et al. (2017) found promising results in an exploratory trial of EMPATHY for reducing depression and suicidality rates among a total of 6,227 participants aged between 11-18 years even after a 15-month follow-up (Silverstone et al., 2017). However, in a qualitative study with administrators of the EMPATHY programme, Hamza et al. (2021) found limitations to the acceptability of delivering content among participants. An important limitation relevant to this researcher is that young adolescents (10-15-years of age) and older adolescents (16-19 years of age) had different preferences towards the therapeutic content. For example, while the cartoon and gamified comic format appeared appealing for younger adolescents, older adolescents preferred more informative videos. Most importantly, Hamza et al. (2021) highlight a significant challenge for designing mental health approaches among adolescents. That is, individuals often have diverse and incompatible preferences towards receiving and accessing mental health support, which tend to be particularly noticeable between younger and

older adolescents (Hamza et al., 2021). Therefore, it may be more beneficial and acceptable to focus on developing mental health approaches for specific sub-populations of adolescents based upon age criteria. In turn, this may help identify specific elements of the intervention that meet the needs and preferences of the intended users (Fleming et al., 2019).

The Resourceful Adolescent Programme (RAP-A) is among the most research-based and accepted preventative programmes focused primarily on young adolescent populations (Schocet et al., 2001; Merry et al., 2004). In short, the RAP-A aims to enhance cognitive and problem-solving skills through a series of 11 sessions of approximately 50 minutes duration. Each week in the programme, young adolescents (aged 11 to 15) learn different skills to understand the relationship between thoughts, emotions, and situations through interactive and gamified activities. The efficacy of delivering the RAP-A programme has been supported by two randomised controlled trials in Australia and New Zealand comprising of a total of 526 young adolescents (Schocet et al., 2001; Merry et al., 2004). In both studies, researchers found reductions in depressive symptoms of 50% or more after the completion of the 11-week intervention (Shochet et al., 2001; Merry, 2004). Acceptability was also high among young adolescents, with over 85% of participants completing the programme in both studies. However, the two studies by Schocet et al. (2001) and Merry et al. (2004) reported small effects related to improvements in depression symptoms on follow-up. Thus, it is likely that the programme's core components are acceptable among young adolescents and show promise in the short term for reducing mental distress. However, it is important to explore how therapeutic results can be maintained while also reducing the amount of time required to implement an intervention.

In contrast to the time required to implement and engage in the RAP-A programme, the Good Behaviour Game (GBG) is a short 10-to-45-minute classroom-based intervention underpinned by behavioural theory (Poduska et al., 2008). In this programme, teachers are encouraged to provide positive reinforcement to primary school students (aged-6-to-13-years) who display appropriate on-task behaviour. While this programme is not primarily designed to prevent mental distress, it has shown promising results for reducing aggression and disruptive behaviours (Kellam et al., 2011; Poduska et al., 2009). For instance, in a randomised field trial of the GBG among 19 primary schools in the United States, Poduska et al. (2008) found that males significantly benefited from the programme with positive adjustments in behaviour even

after two sessions. Many teachers also continued to use techniques from the CBG after completing the study (Poduska et al., 2008).

Nevertheless, similar to other trials of the CBG (for example, Kellam et al., 2011), weak effects occurred for promoting positive behaviours among female students, with mixed results reported on follow-ups. Weak effects on follow-ups may be due to participants being unable to generalise skills across environments. More specifically, positive reinforcement was only provided for participants' behaviour in the school context (Poduska et al., 2008). Thus, individuals in the studies may have been unable to generalise skills across other contexts such as the home or community setting (Bronfenbrenner, 2005).

In New Zealand, the Incredible Years (IY) Parent and Teacher programmes are among the most well-established early intervention and preventative programmes for young people at risk of developing behavioural and emotional challenges (Ministry of Education, 2010). The IY programmes consist of workshops for parents and teachers to learn skills related to creating environments that are more conducive to positive outcomes and managing challenging behaviours (Webster-Stratton et al., 2011). A substantial amount of international research conducted over 20 countries shows improvements in child well-being measures, maintained after six-month follow-ups (Menting et al., 2013; Webster-Stratton et al., 2004; 2011). Promising results of the IY programmes have also been replicated in the New Zealand context among young people from diverse cultural and ethnic backgrounds. Notably, research from the IY cross-agency pilot study published in 2013 showed significant improvements in the following areas: child behaviour median effect size of d=.65, parenting practices median effect size of d=.54 and relationships median effect size of d=.48, In addition, many of these improvements were sustained at the 6-month follow-up (Sturrock et al., 2013). An important caveat to consider is the retention rates of parents attending the IY programmes. Many studies concerned with the IY programmes report that completion rates often vary between 50 to 75% (Gardner et al., 2006; Hutchings & Bywater, 2013; Overbeek et al., 2021). However, these particular studies define 'completion' as attendance of 50% or more of the available sessions.

More research is clearly needed to understand the most effective preventive interventions and components. However, several important themes and implications from the four research should be considered when exploring novel approaches to support young adolescents' mental health. First, as Silverstone et al. (2017) found, researchers must clearly define the population of interest for the intervention. Once the population is defined and their needs and preferences

explored, it is then possible to tailor the content of the programme. This is particularly important given the diverse and often incompatible needs and preferences that exist between the ages of 10-19. Second, it is essential to consider the resources required to implement the intervention and sustain the intended outcomes. For instance, although Schocet et al. (2001) and Merry et al. (2004) found positive results for delivering RAP-P in trial settings, delivering such an intervention in real-world settings may not be feasible or sustainable due to the time and cost required. Instead, research findings of the CBG have shown how it is possible and feasible to deliver a low-cost classroom-based intervention that can be maintained after the completion of the trial. Third, it is worth exploring the potential of implementing interventions across multiple contexts to support behaviour change and maintain positive outcomes (Bronfenbrenner, 2005; Carruthers et al., 2020). This is important because researchers examining the effects of the RAP-A and GBG programme found follow-up results are unlikely to be maintained when the intervention is situated in one context (Kellam et al., 2011; Schocet et al. 2001; Merry et al. 2004). Lastly, while results from the IY programme illustrate the importance of implementing interventions across environments, dropout rates are highly prevalent. This is a major challenge, given that the cost of implementing IY interventions can range from $3000-$5000 per child (Edwards et al., 2016; Ford et al., 2018).

In summary, early interventions and preventative programmes play a pivotal role in the suite of mental health approaches for young adolescents. Many international and New Zealand based early intervention and preventative programmes have shown promising effects in trial settings (Merry et al., 2004; Webster-Stratton et al., 2004; 2011). However, many challenges of these approaches still remain, such as the lack of individualised content for target users, the resources required to implement time-intensive interventions, and poor retention rates.

Psychological Well-Being Interventions

In this section, I discuss psychological well-being interventions, a new type of approach for mental health that may address some of the shortcomings of specialised treatments and other mental health approaches. With reference to the tiered system of mental health approaches, psychological well-being interventions are typically universal. As such, they are non-clinical, directed at entire populations, and they usually seek to address generic mental health risk and protective factors (Huppert, 2009; Purtle et al., 2019). Even though each psychological well-being intervention has its unique focus, they generally aim to promote mental wellness and often to destigmatise mental disorders through a combination of psychoeducation and focused content (Przybylko et al., 2021). In this way, psychological well-being approaches are much

broader and less intensive than specialised mental health treatments. Nevertheless, they can be just as important, if not more, given their extensive reach, appeal, and low cost.

Before summarising and critiquing the most relevant studies related to psychological well-being approaches for young adolescents, it is important to note that research is still in its infancy (van Agteren et al., 2021). While there have only been a small number of randomised control trials completed in this emerging field of research, there are two primary types of interventions that have focused on promoting psychological well-being: **gratitude interventions** and **school-based interventions** (Travagin et al., 2015; van Agteren et al., 2021).

Gratitude interventions for promoting psychological well-being involve individuals identifying specific aspects of their life experiences for which they are thankful (Emmons & Mccullough, 2003; Watkins et al., 2003). Among the first researchers to examine the effects of gratitude on psychological well-being were Emmons and McCullough (2003). In this study, researchers completed a three-armed control trial. One group of participants was asked to journal about negative events or hassles, a second group journal about aspects of life they were grateful for, and the third group about neutral life events. Across the three conditions, participants in the gratitude group demonstrated higher well-being than the other two study groups, as evidenced by a general well-being rating created by the researchers. Froh et al. (2008) built upon these results by conducting a trial of gratitude journaling with 221 adolescents in the US. Similar to the study by Emmons and McCullough (2003), participants were assigned into three groups asked to self-report their well-being. After data was collected daily for two weeks, researchers found that the gratitude condition was associated with greater life satisfaction, school experience and enhanced psychological well-being among the participants (Froh et al., 2008).

Taken together, results from these two studies suggest that gratitude interventions demonstrate some efficacy and are time-sensitive interventions to support adolescents' mental health. Another advantage to this approach is that they circumvent several typical barriers to accessing mental health approaches such as cost, scalability, and time. However, it is important to note writing-based interventions are not suitable for all. For instance, some young people who have not developed the necessary fine motor or comprehension skills may be unable to engage in writing-based interventions (Rosário et al., 2019). Results from gratitude studies should also be interpreted with caution due to methodological issues regarding the lack of formalised measurements for psychological well-being. As evidenced in the study by Emmons and

McCullough (2003), researchers created their own well-being measure, which was then refined in a subsequent study with adolescents by Froh et al. (2008). Given the lack of consensus on a definition for psychological well-being, studies have typically used various measures to assess this concept. This limitation should not be overlooked as it is unclear to what extent the items on different assessments used by researchers accurately reflect psychological well-being constructs (Travagin et al., 2015; van Agteren et al., 2021). Thus, more research is needed to unpack psychological well-being constructs and develop standardised assessments to accurately measure them.

School-based interventions differ from gratitude interventions in that they typically deliver psychoeducational and mental health literacy-based content through a series of workshops in classroom settings. Notably, Runi et al. (2009) were among the first researchers to formally test the efficacy of a school-based psychological well-being programme for young adolescents in a trial with 227 students (mean age = 14.4). The intervention involved delivering six hour-long sessions based on mental health literacy skills, such as learning to identify the relationship between emotions, thoughts, and feelings. Researchers found a significant effect for decreasing distress, anxiety and increasing physical well-being for participants after a six-month follow-up (Ruini et al., 2009). Another promising school-based intervention is 'KORSA', a series of four workshops aimed at promoting psychological well-being for young people in Sweeden. These workshops use similar therapeutic processes to those adopted in the RAP-A, but the structure is less rigid and formulaic. The 'light' level of content in KORSA is based loosely on psychoeducational theories and delivered through interactive exercises (Fledderus et al., 2010; Grégoire et al., 2018; Moghanloo et al., 2015). Even though KORSA has only been evaluated in one randomised control trial of 124 University students in Canada, it has shown preliminary effects for increasing psychological well-being with little training, time, and cost needed to deliver the programme (Morin et al., 2020).

Despite the affordances of psychological well-being interventions, there is mixed evidence overall for these approaches, with some rigorous reviews finding no effectiveness (van Agteren et al., 2021; Piñeiro-Cossio et al., 2021; Zhang & Chen, 2019; Weiss et al., 2021). For instance, in a meta-analysis of writing and journaling interventions for adolescents, Travagin et al. (2015) found minor improvements across the small number of studies for promoting adolescents' psychological well-being. In a more recent systematic review of the literature on psychological well-being approaches by van Agetern et al. (2021), researchers argued that the

evidence for introducing writing-based interventions appears low due to the limited number of studies that are hampered by methodological issues.

As it stands, when interpreting the scarcity of research on gratitude and school-based approaches, these broad interventions show tentative results for promoting psychological well-being. The limited breadth of studies and the lack of standardised assessments does not help form robust conclusions about their efficacy for adolescents, let alone for young adolescents in New Zealand. However, these approaches are worthy of further investigation, and researchers should not give up on them for three key reasons. First, psychological well-being interventions have produced promising results across various outcome measures (van Agetern et al., 2021). While there are methodological issues with adopting different outcome measures to test the same construct, results suggest the broad nature of psychological well-being interventions might be suitable for promoting holistic and interrelated components of well-being (Huppert, 2009). The broad nature of these interventions might potentially be a more culturally sensitive approach for young adolescents in New Zealand, given the diverse cultures this population live in. Second, many psychological well-being interventions require limited resources (Froh et al., 2008). As such, they can be scaled up at a low cost. Third, psychological well-being interventions (e.g. KORSA) are malleable and can easily be adapted based upon the population's needs (Ruini et al., 2009; Fledderus et al., 2010). Rather than using standardised protocols, psychological well-being approaches can be individualised while also incorporating evidence-based processes, including gratitude, mental health literacy, mindfulness, or ACT-based processes (van Agteren et al., 2021; Weiss et al., 2021).

Summary

Specialised mental health treatments, early interventions, preventative approaches, and psychological well-being interventions are all essential to address young adolescents' mental needs in New Zealand. Although young adolescents who experience higher levels of mental distress may benefit from specialised mental health treatments, a combination of mental health approaches is required for different populations. In this review, I have highlighted that a novel, promising scalable and time-sensitive approach for supporting young adolescents' mental health is through psychological well-being interventions. While promising, there are important caveats to consider, such as the scarcity of research and the lack of standardised assessment tools. Despite the lack of research on psychological well-being interventions, they offer promising ways forward to address young adolescents' unmet mental health needs.

Part Three: Digital Mental Health Interventions

So far in this literature review, I have defined the target population for the research and discussed the range of mental health approaches available for adolescents. In this part, I turn to the primary focus of this research, digital mental health interventions (DMHIs).

A wide range of technologies and interventions comprise the broad field of DMHIs. For simplicity, these interventions can generally be referred to as information, specialised content, support, games, or therapy for mental health conditions delivered electronically to treat, elevate, support, or manage symptoms (Torous et al., 2020). DMHIs encompass various approaches, including but are not limited to the unmoderated mental health information on websites, serious games based upon well-established psychological treatments, and telehealth interventions delivered online or in real-time. The extensive range of digital interventions offers potential for users to pick and choose appropriate supports based on their current needs and preferences (Wasil et al., 2021).

Leveraging technology to deliver mental health content and support is a particularly appealing approach for many young people who face a multitude of challenges to accessing therapeutic help (Velasco et al., 2020). As stated previously, barriers to seeking help are complex. While some young people become disengaged with face-to-face therapy, others cannot access therapeutic support due to a range of factors, including cost, stigma and lack of access to services (Andrade et al., 2014; Prins et al., 2008). Ultimately, these factors create challenges to addressing young adolescents' mental health needs during a crucial stage of development. DMHIs, on the other hand, are an appealing approach as they can bypass traditional barriers towards face-to-face therapy. For instance, they can be accessed privately in times of need, are often aesthetically engaging and are low in cost ranging from free to small monthly subscriptions (East & Havard, 2015). They also appear to align with how many people currently search for support and use technology, as evidenced by the 70,000 health-related Google searches worldwide every minute.

Given the ease at which DMHIs can deliver accessible support and the implications of the COVID-19 pandemic, it is not surprising that many digital interventions have been created in recent years (Torous et al., 2020). Although there are currently more digital interventions available than ever before, there are significant issues to this influx of mental health technologies on the App and Goole Play Store (Torous et al., 2021). One such issue is the lack

of processes to safeguard users' personal information (Wies et al., 2021). Another issue is the lack of detail describing how the therapeutic processes were derived for the specific intervention (Chandrashekar, 2018). While I discuss these limitations and others in more depth in the following sections, they have important implications when examining the literature. For example, multiple systematic reviews and meta-analyses of the literature concerning DMHIs are vulnerable to heterogeneity, particularly regarding mixed quality studies, low retention rates and a lack of detail about the digital intervention (Bunyi et al., 2021; Donker et al., 2013; East & Havard, 2015). In addition, while a range of DMHIs are available, most researchers that have used robust protocols in their studies have focused on exploring the effects of mental health apps or serious games (Gan et al., 2021). Thus, instead of reviewing the diverse field of DMHIs, in the following two sub-sections, I will focus on reviewing two of the most relevant digital interventions for supporting young adolescents' mental health: **mental health apps** and **serious games**.

Mental Health Apps

Globally, over 5.4 billion people own a smartphone, and young people contribute to a large percentage of these (Pew Research, 2017; Statista, 2021). The proliferation of smartphone ownership and usage in recent years among young people has added to researchers and developers creating digital solutions for a range of complex situations, including mental health (Chandrashekar, 2018). Apps, small, specific software programmes or applications are popular ways of delivering content via smartphones. As of 2017, it was estimated that over 100,000 publicly apps related to mental health are available on the Apple and Google Play store (Torous & Roberts, 2017). These mental health apps can be categorised into six broad categories based on their functionality: self-management, cognition improvement, skills-training, social support, symptom tracking, and passive data collection (Chandrashekar, 2018).

To untangle the diverse literature related to mental health apps, I will first identify the overarching themes from systematic reviews and meta-analyses on mental health apps before examining two mental health apps in more depth. These two mental health apps are discussed in more detail as they are not only among the most popular apps for young people, but they also illustrate salient strengths and limitations of this field of research.

Over the past decade, many systematic reviews and meta-analyses have been completed to synthesise the literature concerning the efficacy of mental health apps (Bunyi et al., 2021; Donker et al., 2013; East & Havard, 2015), with most reporting similar results. In one of the

first systematic reviews examining the literature on mental health apps among all ages, Donker et al. (2013) found that most apps showed promising results for reducing anxiety and depression in trial settings. Nevertheless, many studies in the review lacked detail about dropout rates and therapeutic processes that underpin the app. Furthermore, several studies were hampered by methodological issues such as limited follow-ups and small samples, and of the 3,000 mental health apps freely available in 2013, only two apps that were identified in the review were publicly available.

While subsequent systematic reviews have corroborated findings concerning the promising effects for mental health apps (e.g., Weisel et al., 2019 and Liverpool et al., 2021), unfortunately, to date, similar methodological issues remain. For example, in the most recent systematic review of the literature on mental health apps for young people and adults, Leech et al. (2021) found three studies that recruited participants under the age of 15, with two completed in Australia and one in the UK (Bruehlman-Senecal et al., 2020; Edridge et al., 2020; Reid et al., 2013). Some of these studies had small sample sizes, limited follow-up, and only one (*Nod*) is currently publicly available on the Google Play store.

As it stands, research suggests that when mental health apps are used, they tend to show promising efficacy for reducing mental distress (Wasil et al., 2019). However, engagement with mental health apps outside of trial settings is often unsatisfactory (Fleming et al., 2019). Further, studies examining the effects of mental health apps are vulnerable to several methodological issues, and less than 2% of publicly available apps have been formally evaluated in trials (Baumel et al., 2019).

Among the mental health apps that are publicly available, '*Headspace*' is one of the most popular among young people, with tens of millions of downloads (Mani et al., 2015; Champion et al., 2018). The goal of *Headspace* is to teach users mindfulness skills such as breathing exercises, body scans, and visualisation through a series of high-quality and engaging short videos and infographics (Bennike et al., 2017). Findings taken together from four randomised controlled trials of *Headspace* suggest that using the app for as little as ten minutes a day can increase well-being among older adolescents and adults (Cavanagh et al., 2013; Howells et al., 2016 Rosen et al., 2018). One of the most relevant randomised control trials of *Headspace* for this research was conducted by Flett et al. (2019) with university students aged 18 to 49, primarily of New Zealand European descent. Researchers randomly assigned participants to use *Headspace*, another mindfulness-based or a placebo for ten minutes each day for ten days

(Flett et al., 2019). Flett et al. (2019) found that both mindfulness apps improved mental well-being, with *Headspace* showing the superior effects overall. Most importantly, researchers provided free access to *Headspace* for participants after completing the trial instead of paying for monthly subscriptions to maintain access to the full suite of features. Of the 208 participants in the study, nearly half reported never using the app after completing the trial despite having free access to it. Thus, similar to findings in systematic literature reviews on mental health apps (Bunyi et al., 2021; Donker et al., 2013; East & Havard, 2015), users are much more likely to engage with apps in trial settings than in real-world environments.

Another popular app for mental health and well-being purposes among young people and has had over 10,000 downloads is '*MoodMission*' (Bakker & Rickard, 2019). Based upon behaviour activation mechanisms derived from CBT, *MoodMission*provides suggestions to users about real-world missions or challenges based upon their goals and values (Bakker et al., 2016). Like *Headspace*, *MoodMission*is designed to be used across demographics, including young adolescents; however, only two randomised controlled trials and a pilot study have been completed with adult populations (Bakker et al., 2018; Bakker & Rickard, 2019). Nevertheless, in both trials of *MoodMission*, participants in the studies comprised 81% and 71% female adults (Bakker et al., 2018; Bakker & Rickard, 2019). The large number of females participating in these studies is important to consider as research suggests females have a higher probability of using an app for mental health and well-being purposes than males (Antezana et al., 2022). In addition, short follow-up surveys were completed by participants after 30 days to assess if these gains had been maintained. Therefore, as females are over-represented as participants across the studies and there were limited follow-ups completed, the findings should be interpreted with caution when generalising across populations.

For digital mental health apps to deliver on their promising potential, it is essential to consider research on their uptake outside of trial settings. In a recent study by Aizenstros et al. (2021), researchers examined the uptake of *MoodMission*in real-world settings by recruiting 238 users aged between 12-63. After users downloaded the app on their phones, participants completed a series of mental health and well-being assessments before and after using the app. Similar to findings in the study by Flett et al. (2019), researchers found that more time spent on the app is associated with higher levels of well-being among users. Nonetheless, many users only completed one challenge, fewer challenges than recommended (Aizenstros et al., 2021). Although higher engagement with mental health apps in trial settings may lead to improved

therapeutic outcomes, findings from Flett et al. (2019) and Aizenstros et al. (2021) suggest engagement in trials may not translate into real-world settings.

While research trials investigating the efficacy of mental health apps have consistently demonstrated promising efficacy (Leech et al., 2021; Wang et al., 2018), significant issues in this field of research have remained since the first systematic review of the literature on mental health apps completed by Donker et al. (2013). These issues include but are not limited to the lack of engagement with mental health apps outside of trial settings, the limited follow-ups with participants, and the insufficient detail on the mechanisms which underpin digital mental health apps.

<u>Serious Games</u>

The global population is estimated to be 8 billion people, and of those, approximately 40% are estimated to play video games at least once a week (Entertainment Software Association, 2020). Mobile gaming, including playing games on smartphones and tablets, is the most popular game method across demographics and makes up almost half (49%) of all gaming revenue. According to Statista's 2020 Global Consumer Survey, male and female gamers spend relatively similar amounts of time playing video games each week, 6.85 hours and 5.8 respectively (Entertainment Software Association, 2020). When considering the implications of the COVID-19 pandemic, it is hypothesised that those aged between 12-20 have spent even more time playing video games than previous generations (Entertainment Software Association, 2020). Games are therefore embedded into the lives of many and consume vast amounts of time. As such, it is no wonder researchers and game developers have tried to leverage the ubiquitous nature of games to address challenges across various domains such as education, finance, and health (Dörner et al., 2016.; Laamarti et al., 2014; Lau et al., 2017).

Games that have non-entertainment goals are referred to as serious games (Lau et al., 2017). Given the popularity of games, serious games appear to be a logical and appealing next step for promoting health and well-being among young people. This is because serious games can deliver content through an attractive platform while also creating non-threatening learning environments where users can practise skills independently. However, in a recent systematic review of the literature on serious games for mental health among young people, only seven studies were identified (David et al., 2020). In addition to the scarcity of research on serious games for young people, several studies were of poor quality with small sample sizes, modest

effects sizes, and results were only based on self-reported data. Given the limited and mixed evidence, however, it can be helpful to review key examples in more depth.

One of the first studies outlined in the systematic review was completed by Clarke et al. (2012), who conducted a single clustered randomised control trial of '*PR:EPARe*', a serious game for teaching positive relationship skills among young adolescents in the UK. While exploratory in nature, there were several issues in this study, including the lack of detail on the design and development of *PR:EPARe*, the duration of the study and the outcome measures (Clarke et al., 2012). These limitations should also be considered in light of a week effect size of 0.150 for 'positive relationship skills' found on self-reported measures. Similar challenges remain among other studies exploring serious games for mental health-related problems. For instance, Steiner et al. (2014) conducted a neurofeedback training study for children with ADHD in the US. Like the study by Clarke et al. (2012), Steiner et al. (2014) found a weak effect size of 0.20 for reducing anxiety. Researchers also relied exclusively on parent reports to make conclusions about their data, and only one study was completed on the game.

In contrast to the small effect sizes reported in the previous two studies, Drechsler et al. (2007) reported a large effect size of 0.378 for reducing anxiety in a randomised control trial of a cognitive behavioural based serious game among children and young adolescents in Switzerland. Researchers used objective data assessments, including parent and teacher reports. Unfortunately, though, limitations to the study include the small sample size of 17 and the incomplete randomisation of participants, threatening the reliability of results (Drechsler et al., 2007). It is important to note these three studies are only a snapshot of the literature on serious games for young people; however, there is clearly a lack of comparable studies that use consistent outcome measures and demonstrate powerful therapeutic effects.

To date, '*SPARX*', a CCBT game aimed at reducing mild-to-moderate levels of depression, is among the most popular serious games for addressing mental distress, specifically among young populations in New Zealand (Fleming et al., 2012). *SPARX* is an interactive fantasy game derived from CBT principles such as problem-solving and relaxation techniques. At the beginning of the game, users choose an avatar and complete a series of challenges to restore balance in a fantasy world full of challenges (Fleming et al., 2012). The four randomised control trials of *SPARX* with adolescents aged between 12-19 have shown promising effects in terms of both clinical and self-reported measures (Fleming et al., 2012; Lucassen et al., 2015; Merry et al., 2012; Sheppard et al., 2018). These findings are significant to consider in the

limited amount of studies exploring the effect of serious games on mental health for young people (David et al., 2020). Importantly, trials of *SPARX* have shown similar effects for reducing depression among diverse ethnic and gender populations in New Zealand, including Māori (Shepherd et al., 2018) and LGBTQ (Lucassen et al., 2015). Given these populations are at high risk of developing elevated levels of distress (Peiris-John et al., 2020), *SPARX* provides a highly acceptable mental health approach for young adolescents across diverse backgrounds.

Research from youth and alternative education providers suggest one of the primary affordances of *SPARX*, particularly among 12-to-14-year-olds, is its engaging and gamified features (Fleming et al., 2012; Ministry of Health, 2016). Consistent with findings from Silverstone et al. (2017), who conducted the early intervention study of EMPATHY, young adolescents prefer mental health programmes that are game-like and playful, such as comic strips. Therefore, when designing mental health approaches for adolescents, researchers must understand the need to adopt gamified elements for younger adolescents (Fleming et al., 2019).

While researchers have yet to explore serious games rigorously with defined assessment outcomes and large population sizes, findings from systematic reviews and randomised control trials on serious games have important implications for designing digital approaches for young adolescents mental health (Lau et al., 2017). These include providing sufficient detail on the specific digital mental health intervention, using multiple types of assessments and exploiting game-like and playful elements for young adolescent populations.

Limitations

Mental health apps and serious games share similar benefits for addressing mental health needs among young adolescents in New Zealand. That is, they are accessible, low-cost and scalable approaches that have a growing evidence base for promoting psychological well-being and reducing psychological distress (Torous et al., 2020). Randomised control trials suggest that, in general, the more sessions or modules users engage in, the more likely they are to experience significant therapeutic effects (Fleet et al., 2019; Wasil et al., 2019). Although digital approaches can lead to positive therapeutic outcomes, I have shown that they must still overcome barriers that have existed for several years, such as maintaining engagement outside of trial settings and replicating findings from single studies.

In addition to the limitations discussed previously, many other challenges remain for digital mental health tools. Privacy and confidentiality are constantly documented as one of the most

pressing issues in digital mental health research (Wies et al., 2021). In a scoping review of digital mental health tools for young people, Wies et al. (2021) reported that many young people are reluctant to use digital mental health tools as they are unsure of how their data will be stored and who will have access to it. According to 'Loughlin et al. (2019), few mental health apps provide sufficient details to understand their mechanisms for storing data, and among those that do, some apps share information with third parties in ways that are not explicitly disclosed in their policies (Huckvale et al., 2019). Further challenges remain, such as the slow design of DMHIs from conception to development, often resulting in a mismatch between technology advances and users' current mode of engagement (Mohr et al., 2017). As evidenced by the design and refinement of *SPARX*, this intervention was initially designed to be played on a desktop computer in hour-long sessions via CD-ROMs. Computers *were* an appealing way of engaging young people; however, technology preferences changed, and subsequently, *SPARX* needed to undergo significant adaptations to keep up with the change in needs (Fleming et al., 2017; Ministry of Health. 2016).

Many DMHIs are developed based on Western models and theories to meet individualistic cultural contexts and needs (Shepherd et al., 2018). For some young adolescents in New Zealand, focusing primarily on thoughts and feelings may not be as meaningful and relevant as supporting more holistic aspects of well-being, such as physical and spiritual components (Durie, 2006). Introducing a Te Ao Māori (Māori world) focus for DMHIs, whereby effort is concentrated on developing a holistic perspective that uses appropriate language and involves users throughout the design process, is a crucial area for more research (Sheppard et al., 2018). This is especially important considering adolescents from indigenous and ethnic minority groups tend to access mental health support less than other populations (Rickwood et al., 2007).

Casual Video Games

So far in Part Three, I have demonstrated how DMHIs, including mental health apps and serious games, can deliver evidence-based mental health content. I discussed promising research trials on mental health apps with a particular focus on *Headspace* and *MoodMission*. Similarly, I showed how serious games, such as *SPARX*, have also demonstrated promising effects on reducing depression. Nonetheless, while most mental health apps and serious games have demonstrated promising efficacy for alleviating mental distress, a plethora of challenges exist. These include but are not limited to the lack of engagement with mental health apps and serious games in real-world settings (Fleming et al., 2016), the number of poorly designed

research studies (David et al., 2020; Donker et al. 2013) and the absence of transparent mechanisms to safeguard users' information (Huckvale et al., 2019). In the following section, I propose a new mechanism that may address some of the limitations outlined above and is a primary focus for this research, CVGs.

CVGs are defined by their ability to be played with no previous game expertise for short periods of time (Consumer Acquisition, 2020). These games are usually designed around simple and popular concepts such as '*Tetris*' and adapted for digital use. '*Flappy Birds*' is a popular example of a simple arcade-style CVG with infinite levels which requires the user to pass through a series of obstacles. *Flappy Birds* had over 50 million downloads and generated approximately $50,000 a day through in-game advertisements in 2014 (Entertainment Software Association, 2020). Asides from *Flappy Birds*, thousands of CVGs have been created for use across various technology platforms, including smartphones, tablets and computers (Brand et al., 2020). Their availability and accessibility appeal to players' diverse preferences and needs. Many adults report playing CVGs for cognitive stimulation purposes (Chesham et al., 2017). Adults may seek out games that involve solving word or math problems, such as '*Bookworm'*, which involves users linking letters to form words. In comparison, younger populations tend to seek out CVGs for social networking purposes (Stroud & Whitbourne, 2015).

Research has explored mechanisms that underpin these games (Iyadurai et al., 2019; Jimison et al., 2004; Russoniello et al., 2013). One of the helpful concepts is that of 'flow'. Initially proposed by Csikszentmihalyi in the 1970s, flow refers to a state of being fully absorbed in intense activities where a particular challenge is equal to the individual's skill level (Csikszentmihalyi, 1996). CVGs are ideally poised to create flow states due to key design features such as clear rules, simple objectives and the gradual increase in challenge to meet the users' current skills (Abuhamdeh & Csikszentmihalyi, 2012). However, research has yet to explore the implications of experiencing flow in CVGs fully.

Figure 4

The Original Three-Dimensional Model of Flow
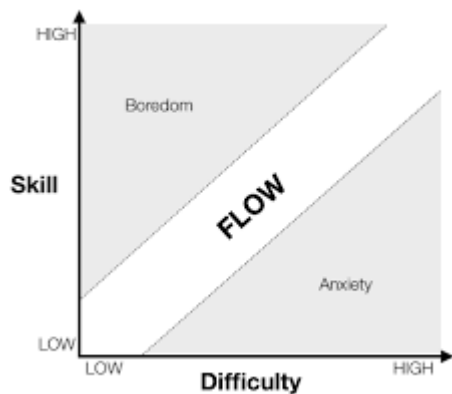
Note: Adapted from *Flow: The Psychology of Optimal Experience* by Csikszentmihalyi, M (2020). New York, NY: Harper & Row. CC BY-NC-SA 3.0.

Over the past decade, a growing number of studies have explored the therapeutic effects of CVGs in trial settings (Iyadurai et al., 2019; Jimison et al., 2004; Russoniello et al., 2013). While these studies and their results are discussed in more depth in Chapter Four, researchers such as Baniqued et al. (2013) have reported that CVGs require different cognitive resources based upon the tasks of the individual game. In a sample of 209 participants ages 18-30, Baniqued et al. (2013) tested the cognitive effects of playing CVGs for five sessions lasting approximately 30 minutes each time. Participants played 20 different CVGs and completed cognitive tests before and after playing the game. Interestingly, games that required users to draw upon specific cognitive related skills such as working memory and problem solving to progress through the game were associated with increased performances on the corresponding assessment after the study (Baniqued et al., 2013).

Similarly, CVGs that require users to engage in visual-spatial tasks such as Tetris have shown promise for reducing rumination and intrusive memories after watching an experimental trauma or real-life trauma (Holmes et al., 2009; Iyadurai et al., 2019; Kessler et al., 2020). Furthermore, Kessler et al. (2020) used brain imaging methods to understand the precise brain areas that are used when playing Tetris. According to neuroimaging techniques, Kessler et al. (2020) found visuospatial resources needed to engage in Tetris compete with the same resources required for formulating intrusive memories. Accordingly, it was hypothesised that playing Tetris soon after experiencing a traumatic event may disrupt the consolidation of new memories (Iyadurai et al., 2019; Kessler et al., 2020).

Although research is still exploring the therapeutic potential of CVGs, emerging research offers promising insights that may overcome some of the challenges associated with mental health apps and serious games. That is, CVGs can be accessed for short amounts of time across environments, are low in cost, appeal to young adolescents and appear to fit with how people currently use technology. The increasing amount of research exploring the therapeutic potential of CVGs (Iyadurai et al., 2019; Jimison et al., 2004; Russoniello et al., 2013)only strengthens the rationale for exploring the potential of CVGs further.

<u>Conclusion</u>

Young adolescents undergo some of the most notable and rapid changes throughout human development (Blum et al., 2020). Even though some young adolescents may thrive in these new situations navigating educational transitions and forming new peer relationships, others may be less successful and more prone to developing adverse outcomes (Ministry of Education, 2010). Specialised mental health treatments can be effective for reducing clinical levels of psychological distress among young people (Fordham et al., 2021. However, receiving support only when psychological distress becomes severe enough has an abundance of issues. Instead of this paradigm, early interventions, preventative programmes and psychological well-being approaches targeting larger populations are much more proactive and scalable ways of providing support for young adolescents. After examining and critiquing the literature, it is evident these approaches have promise, but there are essential factors to consider. These include ensuring interventions are adapted to meet target users' needs and preferences, are low cost, time-sensitive and can be implemented across environments.

Digital mental health interventions are well placed to address some of these challenges as they are low cost, scalable and can be accessed across multiple environments when it is convenient for the user. A growing body of research also suggests that mental health apps and serious games generally promote psychological well-being and reduce psychological distress when they are used in trial settings. Unfortunately, these tools have shown lower engagement in real-world settings. In this review, I have proposed that CVGs may address several limitations of DMHS through their popularity and ability to be accessed across environments for short periods of time. The convenience and fun reported by users who play CVGs (Chesham et al., 2017; Stroud & Whitbourne, 2015) coupled with their promising yet underexplored therapeutic mechanisms create an appealing and real-world approach to explore as a way of promoting young adolescents' mental health.

Chapter Three: Methodology

In this chapter, I discuss the methodology for this research. The chapter is divided into three sections. In the first section, I present an overview of the methodology and explain why it was chosen. In the second section, I examine the method for conducting each study comprising Chapters Four to Eight. The specific processes for each method are outlined in more detail in the corresponding chapter. In the final section, I summarise how the methods fit together.

Methodology

According to Ryan (2006), a post-positivism approach to research can be conceptualised by three broad characteristics:

1. Both theory and practice play important roles;
2. The researcher's perspective, including their motivations for the research, is essential to the research;
3. Research is broad; many different methods and types of research are appropriate.

A post-positivist approach allows researchers to investigate and reinvestigate specific phenomena through multiple lines of inquiry. Research is conducted, *among* others, learning *with* them and making meaning from their perspectives. Rather than only aggregating data to confirm or disconfirm assumptions, this approach accepts contradictions and conflicting interpretations of the data (Ryan, 2007). These contradictions and differing interpretations play an important role in understanding the data at a certain point in time. Given that there is no absolute truth, it is highly probable that future investigations could draw alternative conclusions. Therefore, although claims are made throughout the research, they are refined through the use of quantitative and qualitative methods for more strongly warranted claims. Findings are contextually understood and not generalisable to all cases and situations.

A mixed-method approach refers to integrating qualitative and quantitative data within a single line of inquiry (Wisdom & Creswell, 2013). This approach allows qualitative and quantitative data to be integrated to compare results and identify contradictions (Wisdom and Creswell, 2013). The two types of data collection can also validate findings to form a solid foundation for the research. Another advantage to this approach is that it provides methodological flexibility (Mertens, 2010). The flexibility is reflected in the premise that various methods are required to understand the multiple dimensions of the research problem. As such, a range of

methods can be used that best suit the characteristics and nature of the problem (Tashakkori & Teddlie, 1998).

Gamlen and McIntyre (2018) suggest that a mixed-methods research design informed by a post-positivist approach is well suited to social sciences and health research, as both methods seek to form an objective description and explanation of the data (Gamlen & McIntyre, 2018). This overview is only possible by integrating quantitative and qualitative methods. Each process still upholds its respective strengths, weaknesses, and methodological requirements (Mertens, 2010). However, empirical and scientific methods help researchers develop a more objective overview of the participants' experiences (Gamlen & McIntyre, 2018; Mertens, 2010). In this way, Panhwar et al. (2017) argue that a mixed-methods approach can facilitate the type of knowledge pursued by a post-positivist approach (Panhwar et al., 2017). Importantly, a mixed-methods approach can prevent researchers from fully exploring the phenomena through a single method (Gamlen & McIntyre, 2018). Nevertheless, this is an acceptable limitation in a novel area such as this, given the scarcity of research.

The phases, methods and chapters associated with this research are illustrated in Table 3. In summary, *Phase One* consisted of three studies. In **Study One**, I employed systematic review protocols to examine the literature on the effects of casual video games (CVGs) for anxiety, depression, stress, and low mood. In **Study Two**, I conducted interviews and workshops with young adolescents (aged 13 to 16) to elicit their ideas and preferences related to prototypes of the CVG incorporating mental health concepts. These results were supported by written responses about participants' attitudes towards CVGs. In **Study Three**, I completed an anonymous online survey with health school teachers, psychologists, school counsellors, and social workers to understand their perspectives on adolescent mental health, DMHIs and CVGs. The results of these three studies were synthesised and highlighted that CVGs that incorporated mental health concepts were a promising idea.

In *Phase Two*, I developed and tested the CVG prototype. This involved documenting the development of *Match Emoji* and the collaborative process with multiple stakeholders, including target users and health professionals. I then developed the acceptability and feasibility study protocol for *Match Emoji* that is included in Chapter Eight, Part One. I then completed **Study Four**, a pilot study of *Match Emoji* among 45 young adolescents. This pilot study is included in Chapter Eight, Part two.

Methods adopted at each phase of the project

Table 3

Overview of Methods and Phases Involved in this Research

Phase	Methods	Paper/Chapter
Phase One: Exploring the concept and therapeutic potential of CVGs for young adolescents in New Zealand.	A systematic review of literature on the effects of CVGs for anxiety, depression, stress, and low mood (**Study One**).	The first published paper is included as Chapter Four: Pine, R., Fleming, T., McCallum, S. & Sutcliffe, K., (2020). The effects of casual videogames on anxiety, depression, stress, and low mood: A systematic review. *Games for Health Journal, 9*(4). https://doi.org/10.1089/g4h.2019.0132
	Exploring adolescents' interest in CVGs and CVG prototypes through focus groups and workshops (including individual written responses as well as discussions) (**Study Two**).	The second published paper is included as Chapter Five: Pine, R., Sutcliffe, K., McCallum, S. & Fleming, T., (2020). Young adolescents' interest in a mental health casual video game. *Digital Health Journal, 6,* (1-7). https://doi.org/10.1177/2055207620949391
	An online survey with teachers and health professionals about adolescents' mental health, DMHIs and CVGs (**Study Three**).	The third published paper is included as Chapter Six: Pine, R. (2020). Teachers' and health professionals' attitudes towards adolescent mental health and digital mental health interventions. *Advances in Mental Health, 19*(15). https://doi.org/10.1080/18387357.2020.1814160
Synthesis: These three linked studies highlighted that CVGs that incorporated mental health concepts were a promising idea, as summarised in the preamble of Chapter Seven.		
Phase Two: Developing and testing *Match Emoji*.	Developing *Match Emoji* by consulting with target users, clinicians, game developers and close reading of the literature.	The fourth published paper is included as Chapter Seven: Pine, R., Te Morenga L., Olson, M., Fleming, T., (2021). Development of a casual video game (*Match Emoji*) with psychological well-being concepts for young adolescents. *Digital Health Journal, 7.* https://doi.org/10.1177/20552076211047802.
	Developing the trial protocol.	The fifth published paper is included as Chapter Eight, Part One: Pine, R., Mbinta, J., Te Morenga, L., & Fleming T., (2021). A casual video game with psychological well-being concepts for young adolescents: Protocol for an acceptability and feasibility study. JMIR Research Protocols. *10*(8), e31588–e31588. https://doi.org/10.2196/31588
	Conducting the pilot study (**Study Four**)	A research paper prepared for submission is included in Chapter Eight. Part Two: Pine, R., Mbinta, J., Te Morenga, L., & Fleming T., (*forthcoming*). A pilot study of a casual video game with psychological well-being concepts (*Match Emoji*) for young adolescents. *JMIR Research.*
Synthesis. Results from the pilot study suggested a simple CVG prototype is an acceptable mechanism to deliver psychological well-being content. I discussed the implications for the research in Chapter Nine.		

Systematic Review (Chapter Four)

In Study One (Chapter Four), I aimed to understand the existing research on the effects of CVGs on anxiety, depression, stress, and low mood. A systematic review was deemed an appropriate fit for this aim, given that this methodological approach seeks to rigorously review the literature by following precise and transparent guidelines (Mallett et al., 2012). The methods and essential findings from the systematic review are discussed in more detail in Chapter Four. Here I discuss the methodology for the systematic review.

According to Khan et al. (2003), there are five essential steps to conducting a systematic review:

1) Frame the question
2. Identify relevant literature
3. Assess the quality of studies
4. Summarise the evidence
5. Interpret the findings

Although each step of the systematic process is essential, Faggion and Diaz (2019) suggest that framing the question is a pivotal first step when conducting a systematic review. This step is important because the specific terms used to articulate the research question set the scene for the subsequent phases in the systematic review (Faggion & Diaz, 2019). For instance, the research question helps formulate the precise protocol measures, including explicit inclusion and exclusion criteria, for reviewing the literature (Khan et al., 2013). Once studies have been identified, they are then checked and critically assessed by another researcher to ensure findings are unbiased (Mallett et al., 2012). The relevant studies are then characterised by their intervention, study quality, outcomes, research design and type of analysis. The final stage involves the extraction of relevant data so that results can be synthesised and interpreted (Khan et al., 2013).

Even though a systematic review is considered a reliable way of synthesising research related to a precise question, there are inherent shortcomings. One such limitation, according to (Bramer et al. (2017), is that approximately 40% of systematic reviews retrieve 95% of all relevant references related to the specific research question. It is recommended that a combination of databases and additional methods are necessary to address this limitation and

adequately identify all literature related to the research question ((Bramer et al., 2017; Mahood et al., 2014).

Although challenges are important to consider, such as the precise nature of the research question, a systematic review was still an appropriate first step to understanding the literature concerning the therapeutic potential of CVGs. It also helped identify gaps in the research where I could make a significant contribution. These gaps are discussed in Chapter Four.

Focus groups, Workshops and Open Text Responses (Chapter Five)

In Study Two, I used focus groups, workshops, and open text forms with young adolescents to explore their views of CVGs and their opinions of mental health CVG prototypes (a complete list of questions can be seen in Chapter Five). These approaches were used to support a broader and deeper understanding of participants' perceptions and experiences rather than relying on a single method. For instance, although open text responses enabled young adolescents to express their ideas anonymously about playing CVGs, they only provided a partial account of their experiences. Subsequently, focus groups were used with interested young adolescents to supplement findings and form a richer understanding of the research. In addition, I consulted with a small and interested group of between 5-7 young adolescents at different points within the research. The small group of interested young adolescents expressed initial interest in the game following a presentation to a secondary school form class with 13-15-year-olds. Although small, the insights from the group helped to refine the images, script, and dynamic message loading system.

Darbyshire et al. (2016) recommend that researchers use multiple data collecting methods, such as focus groups and open text responses, to promote participants' autonomy and engagement (Darbyshire et al., 2016). For instance, while some participants may feel comfortable sharing ideas within a group setting, others may prefer to share their opinions in smaller settings (Kitzinger & Barbour, 2011). As this research emphasised the active role all participants have throughout the research process, it was essential to ensure choices were provided about how each young adolescent would like to participate.

Focus groups are often thought of as a hallmark of qualitative research for gathering open-ended data (Kitzinger and Barbour, 2011). They are also deemed appropriate for collecting data from young people as this population is generally familiar with discussing their ideas and opinions in groups (Barbour & Kitzinger, 2011; Darbyshire et al., 2016; Kitzinger & Barbour, 2011). However, a limitation to this approach is that it may not efficiently capture the

maximum depth on a particular issue due to participants being reluctant to express opposing opinions (Vaughn et al., 2012). Workshops with a smaller group of participants (n=21) were created to address this challenge and test new CVG prototypes with target users.

In summary, it is unlikely that a single method would have elicited some of the most important results of this study. In fact, salient themes only emerged from the data once data from focus groups, interviews and open text responses had been integrated. Therefore, these methods provided a valuable approach to exploring the research questions.

Data analysis

I adopted a general inductive approach (GIA) (Thomas, 2016) to analyse the qualitative data in three studies. A GIA is a type of inductive analysis which is well suited to health services research and evaluating questions, where participants' views on relatively specific research questions are sought. It is less in-depth than some other types of qualitative analysis, such as a discourse analysis, where rich experiential insights are sought and often a relatively small number of very in-depth interviews may be used. As this approach was used frequently, I will provide the rationale for why it was chosen here

Thomas (2006) suggests a GIA can be thought of as a systematic set of processes that are well equipped for analysing open text data and focus group qualitative data about pre-established or specific research questions and producing reliable and valid findings. A GIA is a specific inductive process. The approach employs methods that involve close readings of the raw data to obtain concepts, themes, or a model through interpretations (Thomas, 2006). The purpose of using an inductive approach is to allow raw data to emerge naturally without the rigorous constraints of typical experimental or hypothesis testing methodologies. The emphasis is a GIA is on understanding the experiences of individuals and identifying meanings or themes related to the research objectives (Thomas, 2006).

A GIA was a suitable approach for analysing the data from the focus groups, interviews, and open text responses as it helped provide an in-depth understanding of participants' views of CVGs and CVG prototypes. I followed the systematic set of processes outlined by Thomas (2006) to condense the broad and varied raw text data from participants into a brief, summary format.

Each time I used this approach (in Chapters Five, Six and Eight), themes emerging from the raw data were checked by one of my supervisors or an advisor on the research project. This

process helped ensure that themes accurately reflected the meaning of the raw data. Also, it helped to establish transparent and justifiable links between each objective and the findings.

Online Survey (Chapter Six)

Online anonymous surveys are a valuable methodological approach to adopt when seeking to understand the opinions and attitudes of key stakeholders (McInroy, 2016). Online surveys can be developed at a low cost by people with limited technical expertise (Sue & Ritter, 2012). In addition, they offer a scalable approach whereby many participants who are hard to access or are geographically isolated (for example living in rural parts of New Zealand) can participate anonymously in the study.

While there are benefits to using online surveys, there are also several important considerations. For instance, to generalise findings from a survey, the participants must reflect the population from which the sample was drawn (Andrade, 2020). Andrade (2020) recommends using a valid recruitment method to ensure the particular characteristics of a sample adequately represent the population. Further considerations include participants' access to technology, the number of questions, the quality of data obtained and the piloting of the research questions. Given these considerations, I completed a series of steps before conducting the survey, such as piloting the research questions and consulting the literature. In sum, the online survey was a valuable method to adopt to understand key stakeholders' opinions and attitudes towards the research. Significant findings are reported in Chapter Six.

Development of *Match Emoji* (Chapter Seven)

As stated in Chapter Two, many DMHIs exist; however, few have been designed using a collaborative approach that includes target user feedback, academics, health professionals and research (Fleming et al., 2019; Spadaro et al., 2021). The lack of collaboration in the development of DMHIs may help explain the disappointing levels of engagement with these tools outside of trial settings. In addition, claims about the theoretical framework adopted by some DMHIs lack published evidence and transparent design processes to support their efficacy (Torous et al., 2020).

Given these general limitations in digital mental health research, it was essential to document the specific methods and theoretical underpinnings that I used to develop a new game, *Match Emoji*. This iterative design process involved highlighting the work completed in developing the game. For instance, the systematic review of the literature, consultation with target users, clinicians, game developers and close reading of the digital mental health literature all provide

valuable insights which contributed to the development of *Match Emoji*. Expert collaboration was also sought from health professionals and researchers throughout the process to ensure in-game micro messages matched behaviour change and learning theories. Articulating these strengths in the design of *Match Emoji* provided a robust rationale for testing it in an acceptability and feasibility study. A full discussion on the development of the game can be seen in Chapter Seven.

Protocol (Chapter Eight: Part One)

Developing a plan for a trial, also known as a protocol, is becoming increasingly popular across many research disciplines (Dane, Gebbink, et al., 2021). Regardless of the scientific discipline or type of trial, a protocol is an important written tool that provides an opportunity to translate ideas into formal research (Chan et al., 2013). This writing mechanism helps researchers articulate how the research question will be answered, the specific process involved in the study, and the potential implications of the results (Dane et al., 2021). It also functions as an agreement between the investigators and the scientific community whereby third parties (supervisors and ethics committees) can carefully scrutinise the question and design of the study.

The development of a protocol for the accessibility and feasibility study of *Match Emoji* was beneficial for articulating a clear and safe process by which the study would be carried out. This was particularly important in light of the restrictions on face-to-face gathering during the COVID-19 pandemic (discussed in more detail in Chapter Eight). Throughout the development of this protocol, many factors were considered and resolved through discussions with my supervisors and the Human Disability and Ethics Committee (HDEC). These factors involved issues such as at which age students should be required to provide assent and what follow-up process would occur for those students who meet the diagnostic criteria of an anxiety or depressive disorder. Each factor was considered and discussed through consultation with the HDEC, my supervisors and inspection of the literature. These practices resulted in a more robust and safe research process. The protocol is discussed in Chapter Eight, Part One.

Pilot Study (Chapter Eight: Part Two)

Through the pilot study of *Match Emoji*, I aimed (1) to assess the acceptability of *Match Emoji* for young adolescents in New Zealand, (2) to identify the feasibility of the research design and (3) to explore the preliminary well-being and therapeutic potential of *Match Emoji*. I used multiple methods to obtain qualitative and quantitative data before and after the study's

completion that helped answer the three research questions. Methods and results are reported and discussed in Chapter Eight.

Bowen et al. (2009) suggest that conducting a pilot study is important before testing the interventions' efficacy in a more formalised trial (Bowen et al., 2009). This is because the intervention must first address the relevant conditions related to the feasibility of the research process and how well the intervention is accepted among target users. Therefore, before *Match Emoji* was evaluated through a more formal and robust randomised control trial, it was essential to explore if *Match Emoji* was an appropriate game among young adolescents and the research process was viable.

Integrating Results

A comprehensive analysis of the results from each study was completed and is reported separately in the corresponding chapter. The mixed-methods approach allowed for rich information that would not have been possible using only one of the selected methods. Although the present set of studies primarily employed qualitative methods, the quantitative data collected helped explain the findings, which was essential to strengthen the interpretation of findings (Phillips & Burbules, 2001). The results from each study informed and refined the methodology in the subsequent chapters. In the discussion section of this thesis, the findings from each study are integrated to draw conclusions regarding the potential of a new approach to supporting psychological well-being in young adolescents in New Zealand. Strengths, limitations, and recommendations are also discussed.

Summary

This chapter has presented the methodological approach and rationale for each chapter included in this thesis. I needed to adopt a post-positivist mixed-methods approach to answer the broad and related research questions. The flexibility associated with using this approach enabled different methods to be adopted to answer the research questions proposed. A mixed-methods approach also helped to make comparisons between results and identify any contradictions.

Chapter Four: Study One: Systematic Review of Casual Video Games on Anxiety, Depression, Stress and Low mood

Preamble

At the onset of this research, I conducted a preliminary review of the existing literature investigating the therapeutic effects of casual video games (CVGs). After an initial search of the literature, it was clear that a small number of studies had begun to examine the therapeutic role of CVGs. Of those studies that had, there appeared to be variable quality, definitions used to conceptualise CVGs, and many had recruited participants who met the threshold for a clinical diagnosis. Because a systematic review uses rigorous methods to synthesise the existing research related to a specific question, I deemed this an appropriate starting point for untangling the literature related to the therapeutic effects of CVGs.

A systematic review summarises the existing literature related to a specific question or set of questions through a series of precise and reproducible methods (Ganeshkumar & Gopalakrishnan, 2013). The first step in this process involved creating a clear research question. Developing the research question was an iterative process that required consultation with the literature and my supervisors. However, various definitions and terms are used interchangeably in the literature to refer to different mental health and CVG constructs. For example, some researchers use the term CVGs to refer to other types of games, such as serious games. I reviewed the Casual Video Game Association's definition of CVGs and believed this was a clear way of identifying which games could be included and excluded within the search. In a similar way, after conducting an initial search of the effects of CVGs on mental health, I noticed that studies tended to focus on and use terms related to anxiety, depression, stress, and low mood. After identifying themes within the research and refining search terms, the following research question for the systematic review was agreed upon: "What are the effects of CVGs on anxiety, depression, stress and low mood?"

Second, I prepared a comprehensive and reproducible research procedure. This process involved developing inclusion and exclusion criteria for articles in the review. Next, I searched systematically for relevant literature by determining which articles met the predefined inclusion and exclusion criteria. As this was a systematic review of individual studies, the investigation involved a wide range of databases and sources, including grey literature, to maximize the chances of capturing all relevant data and reducing the potential for bias.

Following this, the co-authors and I assessed the quality of the studies together to ensure we could be confident with the findings reported across the studies. This was particularly important given the small sample sizes in many of the studies. Finally, the research findings on the effects of CVGs on anxiety, depression, stress, and low mood were summarised and interpreted.

The Games for Health Journal (G4H) aims to advance the impact of game research, technologies, and applications on human health and well-being and has seen tremendous growth in the quantity and quality of studies published over the past five years. Given the journal focuses on games and health, the aim of the systematic review appeared to be an appropriate fit with the objects of the study. Further, after this article, I was selected to be on the International Games for Health Journal Student Committee. This opportunity supported international collaboration with other PhD students in similar disciplines.

The Effects of Casual Video Games on Anxiety, Depression, Stress and Low Mood: A Systematic Review

Russell Pine, Theresa Fleming, Simon McCallum and Kylie Sutcliffe

Abstract

Introduction: Despite the variety of available treatments for mental health symptoms, many individuals do not engage with treatment and among those who do, dropout rates are often high. Therefore, providing alternative opportunities to access treatment is imperative. Research interest in the therapeutic effects of digital mental health initiatives and serious games has grown in recent years. However, the potential of simple, easy-to-use casual video games (CVGs) that can be played in short bursts of time has seldom been considered.

Objective: The objective of the present study is to provide a systematic review of the literature examining the effects of CVGs on treating anxiety, depression, stress and low mood.

Method: A systematic search was conducted, using the terms (casual gam* or casual videogam* or mini gam* or minigam* or mini-gam* or gamif*) and (mental health or anx* or depress* or stress or mood) and (study or trial or treatment or prescribed or prevention) as 'Title,' 'Abstracts,', 'Keywords' or 'Topic' words across all years. A Google search was also completed to check for articles that may have been missed.

Results: N = 13 studies met inclusion criteria. (No studies were added via the Google search). These studies reported findings for nine different CVGs, with six studies aimed at reducing anxiety, two examining effects for depression and four investigating the effects of CVGs on treating stress or low mood. Promising effects were identified.

Conclusion: CVGs may have promise for treating anxiety, depression, stress and low mood.

Keywords: Casual videogames, mental health, anxiety, depression, stress, mood

Introduction

Globally, approximately 4.4% of the population is estimated to have depression and 3.6% for anxiety disorders (World Health Organisation, 2018). Further, depression is the single leading contributor to global disability (7.5% of all years lived with disability in 2015), with anxiety disorders reported as the sixth highest contributor (3.4%) (World Health Organisation, 2018). As common mental disorders such as depressive disorders and anxiety disorders continue to rise, it is imperative to explore potential treatment approaches (Bower et al., 2001). Cognitive behavioural therapy (CBT) and selective serotonin reuptake inhibitors (SSRIs), alone or in combination for those who do not respond to either pharmacological or psychological interventions, are often recommended as first-line treatments for anxiety and depression (Andrews et al., 2018). In addition to these approaches, it is essential to provide further options that consider client preferences, treatment availability, and cost to increase adherence and acceptability (Ebert et al., 2015). Alternative approaches such as digital interventions (including online or computerised programs or apps) and serious games have shown promise for reducing depression and anxiety symptoms (Fleming et al., 2018; Michael & Chen, 2011). However, the real-world uptake of many evidence-based digital therapies appears disappointing (Fleming et al., 2018).

To date, most published research on the positive effects of video games has focused on the effects of serious games (Stroud & Whitbourne, 2015). The popularity of these games may be due in part to the positive feelings of flow that they elicit. First suggested by Csikszentmihalyi (2000), flow can be best understood as a dynamic equilibrium in which the individual's skills are matched with the game's rules, goals, and challenges. A promising platform for users to experience flow is through a subset of games known as casual video games (CVGs). CVGs are quick, easily accessible games developed across various platforms, such as mobile phones and computers, to increase their availability to users (Stroud & Whitbourne, 2015). Although there is no single definition of Casual Video Games (CVGs), they can be best understood as fun, fast to access and simple to learn games that require short amounts of time to play and no prior video game knowledge or skills (Casual Video Games Association, 2007). CVGs are often based around traditional popular games such as chess, sudoku or pinball, which have been modernised and modified to fit the electronic climate (Fish & Russoniello, 2013). Typically, CVGs are accessible through social media or mobile device platforms with no cost attached. CVGs can be grouped into multiple categories, including casual action (motor skill), casual puzzle (logic), idle games (observation), and casual strategy games (strategy). Such diversity

increases user choice, allowing individuals to select the game that best reflects their current mood or level of interest.

Although many CVGs were developed for teenage users, research indicates that they are popular among people of various ages, genders, and nationalities (Casual Video Games Association, 2007). For instance, among a sample of 263 students with an average age of 20.4 years, Shafter and Carbonara (2015) found high levels of enjoyment in playing CVGs on handheld or console devices. This research is consistent with the growth of the casual game market, in which, for example, the CVG Angry Birds reached 1 billion downloads in 2012 (Cheng, 2012). Similar to other recreational activities, the popularity of playing CVGs may be due to the fun they elicit (Layous et al., 2014). With the variety of CVGs available, most people can choose a game that best suits their interests, thus, maximising users' autonomy and enjoyment. Research suggests that individuals who experience psychological distress related symptoms can benefit from engaging in enjoyable activities (Rupp et al., 2017). Therefore, playing a CVG may provide a similar experience helping elevate some mental distress.

Emerging research suggests that some people play CVGs to relieve stress and improve their mood (Casual Games Market Report, 2007; Rupp et al., 2017). In an online survey of 833 users of online CVGs, participants were asked to answer questions focused on recovery experiences and playing games at work. Reinecke (2009a) reported that participants who play casual games noted a considerable increase in recovery experience from playing games. Those participants who reported higher levels of work-related fatigue displayed an increase in motivation to play games during work hours. Similarly, in another online survey of 1614 participants, Reinecke (2009b) suggested that participants who reported improved recovery experiences from gameplay used games more often after stressful and exhausting situations. While researchers are yet to fully understand the therapeutic potential of CVGs (Fish et al., 2014), these games often include social and competitive components that may create support and social capital as well as eliciting flow states for mediating recovery experiences from daily hassles and stressful situations (Cole & Griffiths, 2007; Collins & Freeman, 2013)

These findings, alongside the popularity of CVGs, suggest that CVGs might form a valuable addition to the suite of available interventions for some individuals, and this is a promising area for further study (Shafer & Carbonara, 2015; Fish et al., 2014). However, there has been limited research in the area to date. We aimed to systematically review the literature regarding the effects of CVGs on treating anxiety, depression, stress and low mood.

Method

Search strategy

A systematic search of the literature was performed in the electronic databases PsycINFO, Web of Science, and Medline. After conducting an initial scoping review of the literature and refining the search terms, the main terms were (casual gam* or casual videogam* or mini gam* or minigam* or mini-gam* or gamif*) and (mental health OR anx* or depress* or mood or stress) and (study or trial or treatment or prescribed or prevention), as part of "Title," "Abstracts,", "Keywords." and "Topic" across all years. A Google search was also completed to ensure that potentially relevant studies not included in the above databases were considered, although no studies were added as a result of this search. As this review focuses on an emerging field of research, it was important to ensure that articles published across a range of years were considered in order to inform the background and discussion. It was also essential to ensure that all significant papers were considered; thus, many sources were used. Initial screening involved reading the title and abstract of each study. For instances in which more information was required to determine a study's suitability for inclusion, the full text was retrieved and read.

Inclusion Criteria

PRISMA recommendations for systematic literate analysis have been followed to avoid the risk of bias. Two authors independently analysed the full papers that met the inclusion criteria, and no discrepancies were found. Studies were included if they (1) were written in English, (2) met the definition of a CVG and (3) described a trial or study that investigated the effects of a CVG to treat, restore or prevent symptoms of anxiety, depression, stress and low mood. As research on CVGs is still in its infancy, few inclusion criteria were specified in order to develop a broad and appropriate set of studies to examine. All study designs were selected as long as at least one outcome measure was used, and the CVG could be delivered on any digital technology, such as a smartphone or computer.

Exclusion Criteria

First, studies were excluded if they focused on games that did not meet the definition of CVGs (i.e. easy to learn games that require short amounts of time to play with no prior game knowledge or skills). The full text was reviewed when a study did not specify the game type in the abstract and appeared to be a potential fit for the inclusion criteria. Second, studies that were not aimed at examining the effects of CVGs on anxiety, depression, stress and mood were

excluded. For example, brain training cognitive process and studies of substance abuse, dementia, Alzheimer's, schizophrenia, Parkinson's and gambling were excluded. Finally, articles that were not written in English were excluded.

Figure 5

Flow chart of included and excluded studies
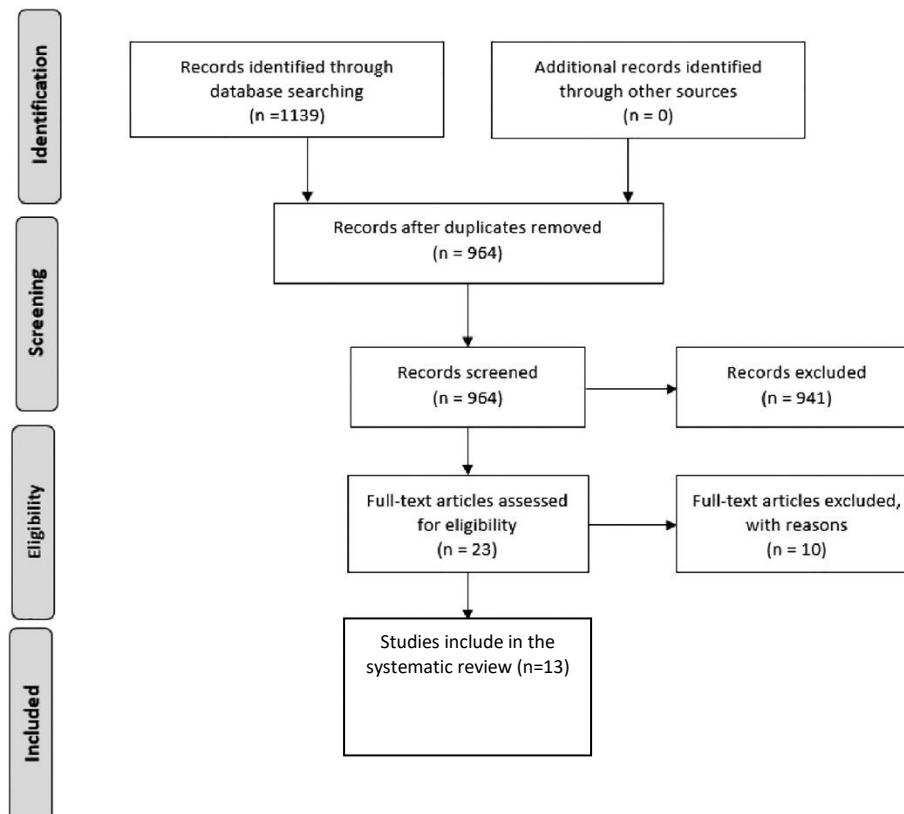
Results

A flow diagram of the selection process can be seen in Figure 1. The search identified over 900 studies, from which duplicates were removed and the remaining abstracts read. Twenty-one articles were identified as potentially relevant to the current review. Articles were read using the inclusion and exclusion criteria to ensure the study used a CVG and aimed to examine the effects of CVGs on symptoms of anxiety, depression, stress or low mood. Four studies used a serious game, two targeted gambling and two examined the effects of CVGs on cognitive functioning. After excluding these studies, thirteen studies remained. From these articles, the following information was collected: authors, publication year, CVG, participant number, outcome measures, treatment topic, game characteristics, game mechanics, intervention length

and comparison treatment. No studies that matched the inclusion criteria were found in the grey literature.

Description of Included Casual Videogames

"Bejeweled 2" is a matching and sequencing game where users swap gems with adjacent ones of the same colour to form chains and earn points. Several modes of gameplay are available, including many secret modes accessed by beating levels of Classic, Puzzle, Endless, Blitz, and Action modes. Good play requires perception and planning.

"Personal Zen" is a gamified attentional bias modification training (ABMT) app involving two animated characters smiling or frowning. Shortly after they appear, both characters burrow into a hole with a happy face, causing a grass path to rustle behind it. Users must trace the path of the rustling grass with their fingers, beginning from the burrow. Good play requires memory.

"Plants vs. Zombies" requires players to prevent a herd of zombies from reaching the user's house using various virtual plants and fungi with different offensive and protective properties. Multiple layout types and modes are available, including Adventure mode, Minigames, Puzzles, Survival, and Zen garden. Good play requires planning, strategy, and spatial logic.

"Bubble Shooter" incorporates both puzzle and shooter elements. The primary aim is to collect as many points as possible by bursting coloured bubbles. To burst the bubbles, users must connect at least three bubbles of the same colour. Good play requires precision and planning.

"Peggle" comprises 55 levels with ~100 blue pegs positioned to correspond with each level's background picture. At each level, users must clear the board of the randomly assorted pegs. If the player does not clear the board with the selected number of balls, they must restart the level. Good play requires planning.

"Bookworm Adventures" is designed around forming words through a grid of available letters. On each turn, players can form a single word, while enemies use one of their available attacks to injure Lex, the bookworm, or manipulate the tiles in the grid. After players have won a certain number of battles, a "boss of increased difficulty" appears. Good play requires perception and planning.

"IMPACT" uses a novel visual search training paradigm, Intrinsically Motivating Playable Attentional Control Training (IMPACT). In IMPACT, smiling and disgusted faces drift

downward on the computer screen. To score points, participants must click on faces of one valence before the faces reach the bottom of the screen. Good play requires perception and precision.

"Sushi Cat 2" is a simple CVG in which players must feed the sushi cat as many pieces of sushi as possible. To collect all the sushi, the cat must drop into the pegs and platforms. Good play requires precision, perception, and planning.

"Frozen Bubble" involves firing a small cannon that shoots bubbles of different colours into a playing area. The objective is to remove all the hanging bubbles by grouping three or more bubbles of the same colour, causing them to burst. Good play requires precision and planning.

Description of Included Studies

Fish et al. (2018) used "Plants vs. Zombies" to compare a prescribed regimen of 30–45 minutes of gameplay with an SSRI medication with a traditional two-medication regimen for decreasing symptoms of state anxiety and trait anxiety. Psychiatrists treating adult clinical populations approached participants, and fifty-four met the criteria and participated in the study. The State-Trait Anxiety Inventory (STAI) was used to determine the level of anxiety pre-and post-playing the CVG. Findings from the study suggested that playing a CVG under a prescribed condition reduced state anxiety symptom severity. Researchers reported that the CVG group reported a medium effect on trait anxiety compared with the medication-only intervention. This significant decrease in state anxiety scores was found after the 1-month prescription of CVG play.

Fish et al. (2014) asked participants to play "Bejeweled 2," "Peggle," and "Bookworm Adventures" to determine the effects of CVG play when used as a prescribed intervention three times per week for 30 minutes over one month to reduce symptoms of anxiety in a depressed population. Fifty-nine participants were recruited through word of mouth and a recruitment flyer distributed to local mental practitioners. The STAI was used to measure anxiety. Researchers found the prescribed regimen of CVG play reduced anxiety symptom severity. Furthermore, participants played an average of 10.7 minutes longer than prescribed.

Russoniello et al. (2013) also used three CVGs, "Bejeweled 2," "Peggle," and "Bookworm Adventures" to examine whether a prescribed regimen of CVG play for at least 30 minutes three times per week for one month could reduce symptoms associated with depression. Fifty-nine participants were recruited through word of mouth and distributing a recruitment flier to

possible referral sources. A PHQ-9 was used to assess depression. Findings from the study suggested that a prescribed regimen of playing CVGs reduced symptoms of clinical depression. These results were found during the study and at the end of the 1-month study.

Horovitz et al. (2016) asked participants to play a single-session attentional bias modification training (ABMT) game, "Bubble Shooter". Researchers were interested in understanding if playing this game could reduce state anxiety among nonclinical populations while waiting for a dental procedure. Seventy-one participants who were seeking treatment in a private dental clinic took part in the study. Modified dental anxiety scale (MDAS), STAI, and overall subjective evaluation scale examined changes. It was reported that distraction tasks such as a CVG have a better immediate effect than ABMT in alleviating state anxiety in nonanxious individuals awaiting a dental appointment.

Russoniello et al. (2009a) used "Bejeweled 2," "Bookworm Adventures," and "Peggle" to understand the brain and heart rate effects of CVGs on mood and stress. Researchers compared people playing CVGs with control subjects under similar conditions. A total of 134 participants were recruited through fliers around the campus community and consisted of students, faculty members, and staff at the university. Electroencephalography (EEG) and heart rate variability (HRV) assessment tools were used. Researchers found that "Bejeweled 2" decreased left alpha brain waves associated with a decrease in withdrawal and depressive-type behaviours. "Peggle" increased right alpha brain wave activity associated with excitement or euphoric behaviours. "Bookworm Adventures" increased the stability of alpha brain waves between the left and right sides of the brain.

Russoniello et al. (2009b) investigated EEG, HRV, and psychological correlates in sixty-nine participants while playing "Bejeweled 2". Profile of mood states (POMS), EEG, and HRV. Researchers reported that playing "Bejeweled 2" increased mood and decrease stress. More specifically, EEG and HRV parameters reported changes associated with improvements in mood.

Russoniello et al. (2019) compared a prescribed regimen of 30–45 minutes of "Plants vs. Zombies" gameplay with a second antidepressant medication regimen for decreasing treatment-resistant depression symptoms (TRDS) and improving HRV. Forty-nine participants who were actively taking a prescribed antidepressant and had expressed concerns after follow-up evaluations took part in the study. A quick inventory of depressive symptomatology (QIDS), PHQ-9, and HRV was used. Researchers reported that a prescribed dosage of CVGs

outperformed the second antidepressant medication regimen in the clinical trial. A single 30-minute session of playing the CVG was significantly more effective in reducing TRDS when compared with the antidepressant medication.

Rupp et al. (2017) used "Sushi Cat 2" to investigate the effects of a passive break, relaxation activity, and CVG on affect, stress, engagement, and cognitive performance. Sixty-six undergraduate students took part in the study for course credit. Affective and cognitive assessments (ACA) were assessment tools used in the study. These included the Positive and Negative Affect Schedule, shortened version of the Dundee Stress State Questionnaire, and backward digit span. It was reported that playing "Sushi Car 2" showed greater engagement and affective restoration than the relaxation condition. The break condition slightly decreased affect and prevented cognitive restoration. It is possible that playing a CVG even briefly restored individuals' affective abilities.

Pieters et al. (2016) explored the effects of a visual search ABM game, called "Intrinsically Motivating Playable Attentional Control Training (IMPACT)", on attention bias processes and mood in undergraduate participants. Fifty-eight undergraduate students participated in study 1 and 82 in study 2 for financial compensation. Mood and Anxiety Symptoms Questionnaire (MASQ), emotional visual search task (EVST), Ruminative Response Scale (RRS), and visual analog scales (VASs) were used before and after playing the game. Although training performance significantly improved, researchers could not show the direct effects of ABMT on attention patterns or stress levels.

Dennis-Tiwary et al. (2016) investigated the effects of "Personal Zen", a gamified ABMT for reducing anxiety among trait anxious adults. Forty-two undergraduate students were recruited from a university and through Craigslist. STAI, EEG, POMS, Beck Depression Inventory-II (BDI-II), Social Stress Test (TSST), and dot-probe task were instruments used in the study. Results demonstrate that a single session of gamified AMBT improved performance during an anxiety-related stress task only among females.

Dennis-Tiwary et al. (2017) used "Personal Zen" to understand if ABMT processes could reduce prenatal threat bias, anxiety, and stress among 29 women in their 19th–29th week of pregnancy. Study recruiters asked women receiving prenatal treatment from a hospital between the 19th and 29th week of pregnancy. Twenty-nine women agreed to participate. The Depression, Anxiety, and Stress Scale (DASS-21), the Hamilton Anxiety Scale (HAM-A), TSST, dot-probe task, cortisol, and EEG were used to answer the research question. Results

showed lower levels of threat bias and laboratory cortisol following ABMT versus placebo training. However, the main effect was not significant and varied among individuals, using the ABMT game reduced biobehavioral indices of prenatal stress and anxiety.

Dennis and O'Toole (2014) asked seventy-eight undergraduate students who reported high trait anxiety scores to play "Personal Zen". The STAI, POMS, BDI-II, TSST, and dot-probe tasks were used. One session lasting 25 minutes of the activity compared with placebo training reduced subjective anxiety and observed stress reactivity.

Parnandi and Gutierrez-Osuna (2017) used "Frozen Bubble" to examine the effectiveness of a breathing-based CVG under three different biofeedback modalities for reducing stress and promoting relaxation. Twenty-five participants aged between 19–33 years took part in the study. Researchers used Electrodermal activity, HRV, and breathing rate to assess the game's effectiveness. Researchers found that the breathing-based biofeedback mechanisms in "Frozen Bubble" effectively induced relaxation during treatment.

Participants

The number of participants in each study ranged from 25 to 134. Some studies recruited participants who reported high anxiety and depressive symptoms, while others recruited participants who reported no psychological distress. None of the studies recruited young people or older adults.

Study Design

Most studies used a randomised-controlled research design (Rupp et al., 2017; Fish et al., 2014; Horovitz et al., 2016; Dennis-Tiwary et a, 2017; Parnandi & Gutierrez-Osuna, 2017) to investigate the effects of CVGs on anxiety, depression, stress or mood symptoms. Fish and colleagues (2018) employed a quasi-experimental design with participants who had been diagnosed with clinical depression. Data were collected across two studies. Russoniello (2013) conducted one clinical experimental study, a randomised controlled study (2009b) and one quasi-experimental study (Russoniello et al., 2019) where participants self-selected a second antidepressant or a prescribed regime of CVG play. In another study by Pieters and colleagues (2016), participants were non-randomly assigned, threatening the validity of findings.

Outcome Measures

Included studies used a variety of outcome measures, with some commonalities across studies. For instance, five studies used the STAI (Fish et al., 2014; Fish et al., 2018; Horovitz et al., 2016; Dennis & O'Toole, 2014; Dennis-Tiwary et al., 2016) to record state and trait anxiety before and after the intervention. The PHQ-9 was used to measure depressive symptoms in two studies (Russoniello, 2013; Russoniello, 2019). Biofeedback was used as an outcome measure in one study (Parnandi & Gutierrez-Osuna, 2017).

Health Condition

Studies included in the search investigated several different conditions. Seven primarily focused on investigating anxiety symptoms, four aimed to reduce stress and low mood, and two measured depressive symptoms.

Effectiveness

Twelve studies reported improvements in the outcome variables after participants played the CVG. Specifically, CVGs were reported to be superior for reducing anxiety compared to a waitlist condition, two-medication regimen, placebo training (PT), and a specific Dental ABMT. These results were reported across participants who reported some and no mental ill-health symptoms (Fish et al., 2014; Fish et al., 2018; Horovitz et al., 2016). In the study by Dennis and O'Toole (2014) and Dennis-Tiwary and colleagues (2017), the ABMT game demonstrated significant improvements in state and trait anxiety. In contrast, Pieters and colleagues (2016) examined the effects of a novel ABMT game to reduce negative bias and reported no significant group differences after playing.

All studies that examined mood and stress noted significant improvements compared with a passive break, surfing the web, or a relaxation activity (Rupp et al., 2017; Russoniello et al., 2009a;2009b). Both studies that examined the effects of a CVG for reducing depressive symptoms found improvements in their outcome variables (Russoniello et al., 2013, Russoniello et al., 2019).

Discussion

We systematically reviewed studies investigating CVGs for treating anxiety, depression, stress, or low mood. Previous systematic reviews have reported promising results for serious games for psychotherapy and videogames for emotional regulation (Eichenberg & Schott, 2017;

Villani et al., 2018), but, to our knowledge, this is the first review to focus on CVGs. Although the therapeutic mechanisms of CVGs have yet to be thoroughly examined and understood, taken together, this small set of studies using a variety of research methods justifies further attention to their therapeutic effects.

First, 12 of the 13 articles reviewed reported improvements in outcome measures after participants played a CVG. Of these, we found that some studies reported a reduction in anxiety and depressive symptoms after a single session of CVG play lasting approximately 30 minutes (Fish et al., 2014; Russoniello et al., 2013, Russoniello et al., 2019). Considering how readily available and inexpensive CVGs are, these emerging results from a single session of CVG play are promising. Moreover, while Pieters and colleagues (2006) did not report any significant effects for participants after playing IMPACT, researchers reported possible explanations for their findings, such as methodological issues recording attentional biases.

Second, the CVGs reviewed shared similar game characteristics. For example, Bejeweled 2, Frozen Bubble, and Peggle all used a variety of bright colours and involved immediate feedback, clear goals associated with tasks, repetitive movements to earn points and progress through the game at an increasing level of difficulty. These characteristics align closely with the characteristics thought to induce flow (Csikszentmihalyi, 2000). Research suggests that when a person is in a state of flow, their attention is allocated to the demands of the task at hand, prohibiting the simultaneous experience of anxiety (Csikszentmihalyi, 2000; Fish et al., 2018). Therefore, the therapeutic effects described in the reviewed studies may be due in part to the CVGs' ability to match players' current skill level, promoting their experience of flow states. In addition, Horovitz and colleagues (2016) reported the immediate effects of participants playing a CVG for distraction purposes while waiting for the dentist. Interestingly, the nature of CVGs may appear to promote opportunities for individuals to distract themselves from an anxiety-provoking situation by engaging in an intrinsically rewarding CVG that captures their attention (Holmes et al., 2009).

Third, although the included studies ranged in size, varied in time spent engaged in a CVG and used different outcomes, triangulation of the results is possible. Findings can be considered more valid if they remain consistent across multiple research methods, as the blind spots inherent to anyone's approach can be illuminated by others (Bekhet, & Zauszniewski, 2012). This appeared accurate in the case of Russoniello and colleagues (2009b), who reported therapeutic physiological changes in the brain while participants played a CVG. Specifically,

participants demonstrated decreased left frontal alpha brain waves, suggesting improvements in mood (Roohi-Azizi et al., 2017). The effects of CVGs for improving mood are similar to that of Fish and colleagues (2014) and Dennis-Tiwary and colleagues (2016), who found a reduction in anxiety symptoms as measured by the STAI.

Moreover, Fish and colleagues (2018) used qualitative methods to gain insight into the flow state experienced by participants while playing CVGs. Participant comments included, "*That was a fun challenge*," "*I want to keep playing*," and "*I felt focused the entire time*". Convergent, positive findings across physiological, psychological, and qualitative methods suggest that more research into the therapeutic potential of CVGs is warranted.

Fourth, although the game characteristic shared similar features, the purposes of the identified CVGs were different. Specifically, the purpose of the CVGs can be broken down into two primary categories: games designed around psychological processes to develop skills such as ABMT (e.g. Personnel Zen and IMPACT) or bio-feedback CVGs (Parnandi, & Gutierrez-Osuna, 2017) and CVGs designed primarily for enjoyment purposes (e.g. Plants vs Zombies and Bejeweled 2). Of the reviewed studies, six studies used an ABMT or a bio-feedback (Horovitz et al., 2016, Dennis & O'Toole, 2014; Dennis-Tiwary et al., 2017; Pieters et al., 2016; Dennis-Tiwary et al., 2016; Parnandi & Gutierrez-Osuna, 2017) while seven used CVGs designed for enjoyment purposes (Rupp et al., 2017 Fish et al., 2014; Fish et al., 2018; Russoniello et al., 2009a;2009b; Russoniello et al., 2013; Russoniello et al., 2019).

The games identified represent a variety of play styles, core mechanics, and challenges. Like most CVGs, there is an emphasis on perceptual skill and precise motor movement as the primary challenges. The "deeper" games that include strategic elements for advanced play, such as "Plants vs Zombies", include these complex elements to extend gameplay beyond the first few hours of play. The range of physical skill and cognitive planning suggests that it is not one particular modality of play or skill demanded of the player that has a beneficial effect. This may indicate that the benefits could be linked to the combination of engagement, cognitive and physical challenge paired with clear rewards for success, which is common to these games.

Finally, the reviewed studies reported high participant adherence to CVG play (Fish et al., 2014; Russoniello et al., 2009a;2009b). For example, many studies prescribed a dosage of CVG play 30 minutes three times a week for one month. Fish and colleagues (2018) adopted this regime of CVG play and reported that, on average, participants played over ten minutes longer (41.1 minutes) each session. Research suggests it is important that individuals with

psychological distress are offered various treatment options to promote their autonomy and adhere to their treatment plan (World Health Organisation, 2015). Some studies offered a choice of CVG, and this approach may offer an appealing option that aligns with an individual's needs and preferences (World Health Organisation, 2015). Moreover, when people actively contribute to their treatment plan, they often report improved outcomes such as reduced anxiety and stress-related symptoms. With estimates of non-adherence to medical treatments reported at 50%, it is important to identify a range of treatments in order to provide alternative options and ensure high levels of participation in the treatment process (Schöttke et al., 2016)

Although small, this set of studies showed promising results, particularly for increasing acceptability towards a regime of CVGs targeted at reducing anxiety, depressive, mood or stress-related symptoms. Furthermore, as collaboration is an essential component of the treatment process, there is room for developing alternative approaches to therapeutic interventions for psychological distress (Schöttke et al., 2016). CVGs, which appear to show promising therapeutic benefits and high acceptability, may be an additional low-cost tool that can be used to support some individuals.

Several limitations must be considered. First, we limited our search to articles published in English; therefore, some potentially relevant articles may not have been considered. Second, to focus on the effects of CVGs on mental health, we excluded studies focused on games aiming to train cognitive functions. Recent studies have suggested that cognitive training control and executive functioning show promise to reduce depressive symptoms and disorders characterised by intrusive thoughts (Keshavan et al., 2014). This is an emerging field of research similar to the current set of studies examining the effects of CVGs on mental health. Future research may look at combining the therapeutic effects of CVGs with those of cognitive training techniques. It is also important to note the keywords which were used in the search. As the term CVGs has many definitions, it is possible we did not identify all similarly related games.

It would also be interesting to consider the therapeutic potential of CVGs among different populations, such as youth. Mental health problems are common in this population, affecting at least one in four young people. Moreover, 13-34-year-olds make up 29% of mobile gamers worldwide (Mediakix, 2019). Taken together, young people's high levels of engagement with CVGs, the need to address psychological distress in this population, and the potential therapeutic benefits of CVGs, point to a promising research direction. Future studies could

extend those considered in this review by including adolescent populations. In addition, although no study reported any side effects from playing CVGs, it would be interesting to investigate the long-term effects of playing these games. Whether or not their therapeutic effects could be maintained is yet to be investigated.

Conclusion

Although evidence-based treatments exist, there is no one size fits all solution for treating mental health symptoms. Furthermore, as common mental health disorders are becoming increasingly prevalent and contribute to losses in both health and functioning, exploring a range of therapeutic options is essential (World Health Organisation, 2018). CVGs are becoming increasingly popular, and people report playing them for a range of reasons, such as relieving stress and relaxing (Reinecke, 2009a; 2009b). As one of the studies highlighted, health care practitioners could consider identifying a regimen of prescribed CVG play to supplement existing medication or other treatment options. This is particularly beneficial for those who wish to engage with additional support or wait to access treatment. The limited array of research findings from the current systematic review does not allow us to draw decisive conclusions about the therapeutic effects of CVGs. However, this review suggests CVGs may have promise for treating anxiety, depression, stress and low mood.

References

Andrews, G., Basu, A., Cuijpers, P., Craske, M., Mcevoy, P., English, C., & Newby, J. (2018). Computer therapy for the anxiety and depression disorders is effective, acceptable and practical health care: An updated meta-analysis. *Journal of Anxiety Disorders*, *55*, 70–78. doi: 10.1016/j.janxdis.2018.01.001.

Bekhet, A. K., & Zauszniewski, J. A. (2012). Methodological triangulation: an approach to understanding data. *Nurse Researcher*, *20*(2), 40–43. doi: 10.7748/nr2012.11.20.2.40.c9442.

Bower, P., Richards, D., & Lovell, K. (2001). The clinical and cost-effectiveness of self-help treatments for anxiety and depressive disorders in primary care: A systematic review. *The British Journal of General Practice: The Journal of the Royal College of General Practitioners, 51*(471), 838-845.

Casual Video Games Association (2007). https://www.org.id.tue.nl/IFIP-TC14/documents/CasualGamesMarketReport-2007.pdf. https://issuu.com/casualconnect/docs/casualgamesmarketreport-2007 (accessed November 18 2019).

Cheng, C.-W. (2012). The System and Self-Reference of The App Economy: the Case of Angry Birds. *Westminster Papers in Communication and Culture*, *9*(1), 47. doi: 10.16997/wpcc.148.

Clark, T., Fleming, T., Bullen, P., Crengle, S., Denny, S., Dyson, B., Peiris-John, R., Robinson, E., Rossen, F., Sheridan, J., Teevale, T., Utter, J. and Lewycka, S. (2013), New Zealand adolescent health trends. J Paediatr Child Health, 49: 925-934. https://doi.org/10.1111/jpc.12427.

Cole, H., & Griffiths, M. D. (2007). Social Interactions in Massively Multiplayer Online Role-Playing Gamers. *CyberPsychology & Behavior*, *10*(4), 575–583. doi: 10.1089/cpb.2007.9988

Collins, E., & Freeman, J. (2013). Do problematic and non-problematic video game players differ in extraversion, trait empathy, social capital and prosocial tendencies? *Computers in Human Behavior*, *29*(5), 1933–1940. doi: 10.1016/j.chb.2013.03.002

Csikszentmihalyi, M. (2000). *Beyond boredom and anxiety*. San Francisco: Jossey-Bass Publishers.

Cummings, C. M., Caporino, N. E., Settipani, C. A., Read, K. L., Compton, S. N., March, J., Sherrill, J., Piacentini, J., McCracken, J., Walkup, J. T., Ginsburg, G., Albano, A. M., Rynn, M., Birmaher, B., Sakolsky, D., Gosch, E., Keeton, C., & Kendall, P. C. (2013). The therapeutic relationship in cognitive-behavioral therapy and pharmacotherapy for anxious youth. Journal of Consulting and Clinical Psychology, 81(5), 859-864. https://doi.org/10.1037/a0033294.

Dennis, T. A., & O'Toole, L. J. (2014). Mental Health on the Go. *Clinical Psychological Science*, *2*(5), 576–590. doi: 10.1177/2167702614522228

Dennis-Tiwary, T. A., Denefrio, S., & Gelber, S. (2017). Salutary effects of an attention bias modification mobile application on biobehavioral measures of stress and anxiety during pregnancy. *Biological Psychology*, *127*, 148–156. doi: 10.1016/j.biopsycho.2017.05.003

Dennis-Tiwary, T. A., Egan, L. J., Babkirk, S., & Denefrio, S. (2016). For whom the bell tolls: Neurocognitive individual differences in the acute stress-reduction effects of an attention bias modification game for anxiety. *Behaviour Research and Therapy*, *77*, 105–117. doi: 10.1016/j.brat.2015.12.008

Ebert, D. D., Zarski, A.-C., Christensen, H., Stikkelbroek, Y., Cuijpers, P., Berking, M., & Riper, H. (2015). Internet and Computer-Based Cognitive Behavioral Therapy for Anxiety and Depression in Youth: A Meta-Analysis of Randomized Controlled Outcome Trials. *Plos One*, *10*(3). doi: 10.1371/journal.pone.0119895

Eichenberg, C., & Schott, M. (2017). Serious Games for Psychotherapy: A Systematic Review. *Games for Health Journal*, *6*(3), 127–135. doi: 10.1089/g4h.2016.0068.

Fish, M. T., Russoniello, C. V., & Obrien, K. (2014). The Efficacy of Prescribed Casual Videogame Play in Reducing Symptoms of Anxiety: A Randomized Controlled Study. *Games for Health Journal*, *3*(5), 291–295. doi: 10.1089/g4h.2013.0092.

Fish, M. T., Russoniello, C. V., & O'Brien, K. (2018). Zombies vs. Anxiety: An Augmentation Study of Prescribed Video Game Play Compared to Medication in Reducing Anxiety Symptoms. *Simulation & Gaming*, *49*(5), 553–566. doi: 10.1177/1046878118773126

Fish, M., & Russoniello, C. (2013). Casual Video Game Play as an Augmentation Intervention for Depression and Co-morbid Anxiety: A Controlled Study. *Applied Psychophysiology And Biofeedback, 38*(3), 234

Fleming, T., Bavin, L., Lucassen, M., Stasiak, K., Hopkins, S., & Merry, S. (2018). Beyond the Trial: Systematic Review of Real-World Uptake and Engagement With Digital Self-Help Interventions for Depression, Low Mood, or Anxiety. *Journal of Medical Internet Research*, *20*(6). doi: 10.2196/jmir.9275

Holmes, E. A., James, E. L., Coode-Bate, T., & Deeprose, C. (2009). Can Playing the Computer Game "Tetris" Reduce the Build-Up of Flashbacks for Trauma? A Proposal from Cognitive Science. *PLoS ONE*, *4*(1). doi: 10.1371/journal.pone.0004153

Horovitz, O., Roitburd, B., Abend, R., Ziskind, D., & Shechner, T. (2016). Distraction versus training attention away from threat: How to best wait for the dentist? *Australian Journal of Psychology*, *68*(3), 191–199. doi: 10.1111/ajpy.12128

Keshavan, M. S., Vinogradov, S., Rumsey, J., Sherrill, J., & Wagner, A. (2014). Cognitive Training in Mental Disorders: Update and Future Directions. *American Journal of Psychiatry*, *171*(5), 510–522. doi: 10.1176/appi.ajp.2013.13081075

Layous, K., Chancellor, J., & Lyubomirsky, S. (2014). Positive Activities as Protective Factors Against Mental Health Conditions. *Journal of Abnormal Psychology*, *123*(1), 3–12. https://doi.org/10.1037/a0034709

Michael, D., & Chen, S. (2011). *Serious games: games that educate, train, and inform.* Mason, OH: Course Technology.Overview: Depression in adults: recognition and management: Guidance. (2009). Retrieved July 5, 2019, from https://www.nice.org.uk/guidance/CG90.

Parnandi, A., & Gutierrez-Osuna, R. (2017). Physiological Modalities for Relaxation Skill Transfer in Biofeedback Games. *IEEE Journal of Biomedical and Health Informatics*, *21*(2), 361–371. doi: 10.1109/jbhi.2015.2511665

Pieters, E. K., Raedt, R. D., Enock, P. M., Putter, L. M. S. D., Braham, H., Mcnally, R. J., & Koster, E. H. W. (2016). Examining a Novel Gamified Approach to Attentional Retraining: Effects of Single and Multiple Session Training. *Cognitive Therapy and Research*, *41*(1), 89–105. doi: 10.1007/s10608-016-9803-z

Reinecke, L. (2009a). Games at work: *The recreational use of computer games during working hours. Cyberpsychology & Behavior, 12*, 461–465.

Reinecke, L. (2009b). Games and recovery: The use of video and computer games to recuperate from stress and strain. *Journal of Media Psychology: Theories, Methods, and Applications, 21*, 126–142.

Roohi-Azizi, M., Azimi, L., Heysieattalab, S., & Aamidfar, M. (2017). Changes of the brain's bioelectrical activity in cognition, consciousness, and some mental disorders. *Medical Journal of the Islamic Republic of Iran*, *31*(1), 307–312. doi: 10.14196/mjiri.31.53.

Rupp, M. A., Sweetman, R., Sosa, A. E., Smither, J. A., & Mcconnell, D. S. (2017). Searching for Affective and Cognitive Restoration: Examining the Restorative Effects of Casual Video Game Play. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *59*(7), 1096–1107. doi: 10.1177/0018720817715360.

Russoniello, C. V., Fish, M. T., & Obrien, K. (2019). The Efficacy of Playing Videogames Compared with Antidepressants in Reducing Treatment-Resistant Symptoms of Depression. *Games for Health Journal*, *8*(5), 332–338. doi: 10.1089/g4h.2019.0032.

Russoniello, C. V., Fish, M., & Obrien, K. (2013). The Efficacy of Casual Videogame Play in Reducing Clinical Depression: A Randomized Controlled Study. *Games for Health Journal*, *2*(6), 341–346. doi: 10.1089/g4h.2013.0010.

Russoniello, C. V., O'Brien, K. M., & Parks, J. (2009a). The effectiveness of casual video games in improving mood and decreasing stress. *Journal of Cyber Therapy and Rehabilitation, 2*(1), 53-66.

Russoniello, C., O'Brien, K., & Parks, J. (2009b). EEG, HRV and Psychological Correlates while Playing Bejeweled II: A Randomized Controlled Study. *Studies in Health Technology and Informatics, 144*, 189-92.

Schöttke, H., Flückiger, C., Goldberg, S. B., Eversmann, J., & Lange, J. (2016). Predicting psychotherapy outcome based on therapist interpersonal skills: A five-year longitudinal study of a therapist assessment protocol. *Psychotherapy Research*, *27*(6), 642–652. doi: 10.1080/10503307.2015.1125546

Shafer, D., & Carbonara, C. (2015). Examining Enjoyment of Casual Videogames. *Games for Health Journal, 4*(6), 452-459. doi: 10.1089/g4h.2015.0012

Stanhope, V., Ingoglia, C., Schmelter, B., & Marcus, S. C, (2013). Impact of Person-Centered Planning and Collaborative Documentation on Treatment Adherence. *Psychiatric Services*, *64*(1), 76–79. doi: 10.1176/appi.ps.201100489

Stroud, M. J., & Whitbourne, S. K. (2015). Casual Video Games as Training Tools for Attentional Processes in Everyday Life. *Cyberpsychology, Behavior, and Social Networking*, *18*(11), 654–660. doi: 10.1089/cyber.2015.0316

Villani, D., Carissoli, C., Triberti, S., Marchetti, A., Gilli, G., & Riva, G. (2018). Videogames for Emotion Regulation: A Systematic Review. *Games for Health Journal*, *7*(2), 85–99. doi: 10.1089/g4h.2017.0108.

World Health Organization. (2018). Mental health atlas 2017. World Health Organization. https://apps.who.int/iris/handle/10665/272735. License: CC BY-NC-SA 3.0 IGO.

Chapter Five: Study Two: Young Adolescents' Interest in a Mental Health Casual Video Game

Preamble

In this chapter, I build upon findings from the systematic review by exploring young adolescents' interest in CVGs and prototypes of CVGs adapted for mental health and well-being purposes through open-text response forms, focus groups, and workshops. The focus groups and workshops were designed to elicit young adolescents' preferences towards prototypes. The prototypes were developed in collaboration with feedback from young adolescents and post-graduate students enrolled in the School of Engineering and Computer Science and School of Health at Victoria University of Wellington.

The existing relationships I had with school personnel facilitated communication when scheduling focus groups and workshops across various primary and secondary schools. It was important to ensure reciprocity between schools was maintained by spending time before, during and after the research to strengthen relationships and share research findings. As Brookman-Frazee et al. (2016) discuss, research-community partnerships can promote knowledge exchange that is particularly valuable for communities with limited access to resources. Furthermore, the relationships between researchers and communities can also increase sustained collaboration in the future (Brookman-Frazee et al., 2016). The sustained partnership in this research was evident by school stakeholders' and participants' eagerness to be involved in **Studies Three** and **Four**.

In this chapter, I present the research findings of the exploratory study in the form of a published article. The Digital Health Journal aims to publish open-access research on novel ways of using technology to promote health outcomes. Given the novelty of this research, I thought this study was an appropriate fit with the journal.

Young Adolescents' Interest in a Mental Health Casual Video Game

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Abstract

Background: Mental distress and disorders among adolescents are well documented. Despite the array of treatments available, many mental health issues remain untreated and often undiagnosed. In an attempt to narrow the treatment gap, researchers have adapted existing mental health interventions into digital formats. Despite their efficacy in trial settings, however, real-world uptake of digital mental health interventions is typically low. Casual video games (CVGs) are popular among adolescents and may be a promising tool to reduce stress, anxiety and depression. *Aim*: We set out to explore young adolescents' views of CVGs and their opinions of mental health CVG prototypes to help determine whether this idea warrants further investigation. *Methods*: Pen and paper feedback forms following a brief presentation to 13–15-year-old adolescents in seven high schools (n = 207) followed by more detailed focus groups (n = 42) and workshops (n = 21) with interested students. *Findings*: Across all three methods, participants reported playing CVGs several times a week or day to help relieve stress, feel more relaxed and relieve boredom. Most were also interested in the idea of a mental health CVG. Participants in focus groups and workshops confirmed that playing CVGs was common among themselves and their peers and that the idea of a CVG with subtle and brief mental health content such as game-linked 'micro messages' was appealing. Participants recommended that the game should have an engaging interface and subtle mental health skills and content. *Conclusions*: Findings from this exploratory study suggest that the concept of a mental health CVG appears to be appealing to adolescents. This novel approach should be tested.

Introduction

Globally, 10–20% of children and adolescents meet the criteria for a mental health disorder (World Health Organisation, 2017). Despite developments in evidence-based treatments, nearly two-thirds of adolescents with an identified mental disorder never seek help from a health professional (Lockett et al., 2018). This is due to external and internal barriers such as lack of available therapists, costs, convenience, stigma and confidentiality concerns (Gulliver et al., 2010; Wilson & Deane, 2001). In part to address these issues, digital therapies have been developed. One of the most commonly tested formats, computerised cognitive behaviour therapy (cCBT), has been shown to have comparable effects to face-to-face therapies (Hollis et al., 2017; Ebert et al., 2015). However, engagement with digital mental health tools outside of trial settings has typically been disappointing (Fleming et al., 2016; Thabrew et al., 2018).

Systematic, 'top-down' approaches enable users to receive standardised, evidence-based content. However, this brings challenges. Internet user preferences and interfaces change rapidly; therefore, tools may be outdated when they are released (Baumel et al., 2019). Many mental health tools aim to provide a full treatment program, which may be a poor match with the way people often dip in and out of apps and programs (Bowman, Schultheiss & Schumann, 2012). In addition, some tools retain unnecessary components of traditional therapy within new technologies, a process described as 'skewmorphism' (Scholten & Granic, 2010). For example, weekly full or half-hour sessions may work well for clinical appointments but are not necessarily the best use of internet formats. A deep understanding of target users' needs and behaviours and high-quality co-design processes is likely to improve engagement and satisfaction with digital mental health tools (Fleming et al., 2016; Thabrew et al., 2018).

Earlier research with culturally diverse adolescents in New Zealand (NZ) has demonstrated that teens consider mental distress common and yet consider it normal to only seek help in crisis situations (Thabrew et al., 2018; Fleming, Dixon & Merry, 2012; Fleming et al., 2019). Consistent with international research, NZ adolescents reported that they face barriers to mental health support, including not recognising distress as health need that they could get help for, feeling too hopeless, uncertain or embarrassed to seek help, and more external barriers such as lack of face-to-face treatment, delays in receiving help, or a poor fit with available therapists (Thabrew et al., 2018; Fleming, Dixon & Merry, 2012; Fleming et al., 2019). Youth centred research demonstrates that adolescents make use of a variety of digital tools to support their

mental state, such as posting on social media and watching videos or playing video games. Video games are played by millions of adolescents and adults around the world for a variety of reasons, such as to relieve stress and relax (Limelight Networks, 2019; ESA, 2019). Video games vary from complex multiplayer games to simple repetitive casual video games (CVGs).

These CVGs, such as "Candy Crush" or "Angry Birds", are among the most popular type of video games (Limelight Networks, 2019). CVGs can be best defined as "fun, fast to access and simple to learn games which require short amounts of time to play and no prior video game knowledge or skills" (Causal Games Market Report, 2007). CVGs encompass multiple categories and skills, including casual action (motor skill), casual puzzle (logic), idle games (observation), and casual strategy games (strategy). With the diversity of CVGs, they are a popular tool used among broad groups of individuals. The popularity and potential therapeutic effects of CVGs were consistent with the literature review conducted by members of our team (RP, TF, KS, and SM). Using these ideas as a basis, we consulted with cross-disciplinary researchers and young adolescents. We conceptualised a novel tool that capitalises students' pre-existing engagement with CVGs and adds a mental health component. This was the initial formulation of a CVG with straightforward mental health content. This paper aims to report the process and results of this initial concept testing and implications to help understand whether mental health CVGs are a promising approach to supporting young adolescents' mental health.

Methods

Recruitment: High schools were selected from different deciles (a measure of the socio-economic position of a school's student community relative to other schools throughout the country) across the Wellington region. Senior managers or pastoral leaders in seven high schools were approached, and all gave consent for students to participate in the study. Student and parental consent were obtained for participants who were involved in the focus groups and workshops.

Presentation and pen and paper responses: In each school, researchers (TF, RP, KS, or SM) gave a presentation to introduce the concept of a CVG with mental health concepts. Following each presentation, pen and paper questions designed to elicit preferences and scope initial interest were administered (Table 4). A total of 207 year 9 and year 10 high school students

(13–15 years of age; 52% males; 48% New Zealand European, 30% Maori, 12% Pacific Island) completed the pen and paper question across all groups. Students reported their own demographic characteristics. When a student reported more than one ethnic group, they were categorised into Maori, Pacific Island, New Zealand European, or other using the New Zealand Census Ethnicity Prioritisation Method (Poutasi, 2014). We also spoke with students about their perspectives and ideas for the game. These discussions were summarised and recorded as field notes.

Table 4

Pen And Paper Response Questions

1) How often do you play apps or casual video games? (Response options: never, about once a week or less, several times a week, or several times a day)
2) What are your thoughts about a casual video game with mental health concepts?
3) If you play apps or casual video games do they make you feel? (Response options: more relaxed, less bored, more focused, more calm, more stressed, more frustrated, more annoyed and other)
4) How old are you?
5) What is your ethnic identity?
6) Have you felt down, depressed or very anxious for more than a few days in a row? (Response options: yes or no)

Focus groups: At the end of each presentation, students were asked if they would be interested in taking part in focus groups to understand their views on existing CVGs and explore their preferences for the new game. From the 207 students involved in the initial consultations, 42 students took part in the focus groups. Focus groups were held at high schools and involved up to 15 participants each. Researchers (TF, RP, KS or SM) used a schedule of open-ended questions to guide discussions (Table 5). Each focus group lasted approximately 30 minutes.

Table 5

Interview Questions

1) If you had played a CVG when was the last time you played?
2) Can you recall what was happening beforehand?
3) How did you feel when you started?
4) Where were you?
5) How long did you play for?
6) How did you feel doing it?
7) Were there any good things about playing for you?
8) Were there any less good or bad things?
9) What is good and not so good about the prototype?
10) What would improve it?

Workshops: Once the CVG prototype was developed, we asked students from the focus groups if they would be interested in providing feedback on the game. A total of 21 students expressed interest and took part in the workshops. Each workshop comprised 6, 7 or 8 participants. Researchers (TF, RP, KS or SM) used a schedule of open-ended questions (Table 4) to ascertain participants' views of the prototype.

Data analysis: We employed a General Inductive Approach (GIA) proposed by Thomas (2006) to identify the broad explicit and implicit themes within the data. First, we closely read the raw data across the three methods. Next, data were clustered into themes, which were highly consistent across pen and paper responses, focus groups and workshops. In the focus groups and workshops, more specific details were recorded about the look and feel of the game. We elected to combine the results, structured under three key themes (below), with participant quotes in italics. Although all participants had the opportunity to complete the pen and paper response form, some participants omitted some questions.

Results

Theme 1: *Young adolescents play casual video games, and they play for a variety of reasons*

In the pen and paper responses, 91% (188 out of 207) of young adolescents stated that they play CVGs. Those who reported playing CVGs endorsed a variety of reasons, most commonly to feel more relaxed (68%; 128 out of 188), more calm (60%; 112 out of 188), and less bored (57%; 107 out of 188). Some focus group participants reported playing specific games on their phone to help them feel less stressed or less bored "*I have different categories on my phone for different moods....like I will play some games to feel less stressed or when I am bored*". In the workshops, students mentioned that the games they find relaxing often involve simple mechanisms, such as swiping or tapping, and use smooth colours "*If you are trying to make it chillaxing then simple stuff is good like a couple of colours*", "*Games that are relaxing only involve tapping a balloon or swiping some colours so do that I reckon*" and "*Sometimes I need to do pointless stuff to be less bored like tap a candy and get a reward*".

Theme 2: *Young adolescents were interested in the idea of a mental health casual video game*

Most participants were interested in playing a mental health CVG. In the pen and paper responses, many thought it was "*a cool concept*" "*beneficial for us students*" or "*a great idea*

and could help heaps of people". A number of participants mentioned they thought it was a good idea because CVGs are popular and are designed to be fun. "*Nice idea because casual games are fun*". "*Sounds very similar to games I play so should be fun*" and "*Seems like the games we play, and I play heaps of them*". Pen and paper responses to the question 'have you felt down, depressed or very anxious for more than a few days in a row?' was consistent with the identified need to address mental health concerns. Approximately 66% (122 out of 186) of respondents who answered this question reported they had felt down, depressed or anxious for more than a few days in a row. These findings were supported with data from focus group participants, who mentioned that "*I think it's a good idea to help heaps of kids who are depressed or anxious cheer up, and I know a lot*!", "*I feel down sometimes and guess anything to help would [be] good*", "*Think it's a good idea because you can focus on mental health, which is super important, like some friends I know could use this still but at the same time make it enjoyable for teens*". Consistent with the initial scoping phase, focus group participants identified the need to help young people with their mental health. Although some mentioned that many young people might not wish to talk about their concerns, they thought that a mental health CVG may be a promising and appealing platform for learning skills and supporting conversations about mental health.

In the focus groups, participants stated "*Good idea because many people like casual games and lots of people don't like talking about their problems*", "*Good way of incorporating mental wellbeing into a modern theme*", "*Great. People already spend heaps of time playing games on their phones, so it would be good, important and makes sense to combine both mental health awareness and games*" and "*Pretty relatable and heaps of people could learn more about mental health*". In general, participants were excited about the idea and interested in helping to develop the game. Some expressed interest in commenting on design aspects of the game, or even, in the case of some workshop participants, contributing graphics "*I think the concept is brilliant and am keen to help out*", and "If it helps with my negative thoughts, let's *do it!*" "*Seems cool as, keen to help I could even make some pictures*" and "*I've got a cool as image of good and bad thought you could use*".

Theme 3: *Recommendations*: *An engaging interface and subtle mental health information*

Participants provided several recommendations when asked to write their thoughts about a CVG with mental health concepts. First, in the pen and paper responses, participants

mentioned that an engaging interface is important to motivate people to play "when designing the game use clean and easy to look at images and messages" and "you have to make the game simple and fun to play otherwise people will not play and learn about mental health". Many games that students play involve simple, appealing colour palettes. They recommended using "just a few colours", "making it simple with not many colours" and "colours need to flow". In the focus groups, participants mentioned that it was important to keep the mental health information and skills subtle. They recommended making the game fun as the first priority and advised that mental health concepts should be used discreetly "you have to make it fun otherwise no one will play", "don't be too heavy-handed with the messaging and it will work" and "the more subtle with the mental health stuff the better". Workshop participants also thought the game could be used as an adjunct to face-to-face therapy "the game could help you remember stuff you learnt before, kinda like a homework type thing", "you could use the game if you forgot a mental health tip".

Discussion

In this stepwise exploratory study, we found that many young adolescents reported playing CVGs and endorsed several reasons for doing so, such as relieving stress, feeling more relaxed, and relieving boredom. In general, young adolescents expressed interest in the idea of a mental health CVG and wanted to take part in the design process. Participants suggested that an engaging interface and subtle mental health information were important features to consider. These preliminary results suggest that a mental health CVG is a promising approach to build.

One key finding from the study was that young adolescents play CVGs and play them for many reasons. It has been well documented that CVGs are popular among adults who play for a variety of reasons. For instance, Stroud and Whitbourne (2015) conducted an online survey about the use of CVGs with 10,308 adults ranging from 18 to 80 years. Researchers found CVGs are highly acceptable among adults, especially those aged 60 and older. Researchers also reported that many adults play to relieve stress and enjoy the challenge of CVGs. These results are similar to an online survey by Reinecke (2009), who recruited 1614 adult users of casual games. Reinecke (2019) found that participants who played games reported an increase in feelings associated with relaxation after playing. However, the

therapeutic potential of this simplistic approach for adolescents has been less understood despite their high interest in playing CVGs.

Another important finding from the current study was that young adolescents were interested in the idea of a mental health CVG. Many participants stated this was important to help young people with their mental health, especially those who may not wish to talk about their distress. This is an important finding as it builds our preliminary work that suggests young adolescents generally do not actively seek help unless their concerns become serious enough (Fleming, Dixon & Merry, 2012). Therefore, using an existing and non-threatening model of engagement appears to be a promising opportunity that aligns with young adolescents' current needs and preferences. Participants stated that using CVGs is a modern way of promoting mental health because CVGs are fun, and many young people are familiar with them. Mobile phones and CVGs are embedded into the lives of many adolescents, who typically play 2–3 times per day in short, 5–15-minute bursts. CVGs may provide an attractive platform for digital mental health developers to capitalise on, given such popularity already has been established (Reinecke, 2009). This approach can be contrasted with traditional digital mental health approaches, which have attempted to fit therapy onto platforms such as tablets, computers or CD-ROMs. To date, there has been limited research working from a bottom-up approach to match the delivery of mental health content with the way youth are currently using technology (Thabrew et al., 2018; Scholten & Granic, 2019; Tuerk et al., 2019; Brooks et al., 2016).

Using CVGs may have additional advantages, such as providing scalable and non-stigmatising ways to access therapeutic content for adolescents. Furthermore, young 'digital natives' may prefer this method over psychotherapies with counsellors and therapists, as they are more familiar and comfortable with this platform (Brooks et al., 2016). Although the current approach is not designed to treat or elicit disclosures of mental health difficulties, participants reported a high level of acceptability of using this platform to promote mental health content. Participants gave recommendations such as using simple colours for an engaging interface and a subtle level of mental health information. They reported that it was important for the game to increase in difficulty to ensure it was not too easy or hard. According to flow theory, it is important to design games whereby the skills of the individual are matched with the rules, goals and challenges of the task (Csikszentmihalyi, 2014). Popular CVGs such as Candy Crush capitalise on this idea by increasing the difficulty of levels as a player moves through the game. These games have also identified the importance of colours. Candy Crush, for example, uses

three primary (red, yellow, blue) and three secondary colours (orange, green, purple). This simple palette ensures high contrast to maximise the clarity of images and text on mobile devices (Varonis & Varonis, 2015). Finally, some students recommended that the game could be used to supplement face-to-face therapy. This idea is important to consider given the importance of reinforcing content discussed in therapeutic contexts (Kazantzis, Whittington, & Dattilio, 2010).

Strengths and limitations

This was a small study that used several distinct methodological approaches among seven high schools in the Wellington region of New Zealand. It was an appropriate approach for an exploratory scoping project to help understand the role and popularity of CVGs among young adolescents. Participant responses provided a rationale for developing this idea further and user feedback regarding the design of a mental health CVG. However, this study was not designed to be generalised to other populations hence the small sample size. Future research could attempt to replicate these findings across different populations of adolescents. In addition, it would be interesting to examine or test the mechanisms of change that contribute to the therapeutic effects of CVGs in order to inform the development of the game..

Conclusion

Findings from this stepwise exploratory study suggest that many young adolescents play CVGs and do so for a number of reasons, such as to relieve stress, feel more relaxed and relieve boredom. Participants were interested in the idea of a mental health CVG, articulating that it is important to address mental health issues among their cohort. They also noted that CVGs are popular and designed to be fun, therefore this approach offers a modern way of supporting mental health. Students provided design recommendations for the CVG, such as creating an engaging interface and subtle mental health skills and information. Involving adolescents in the design process of a mental health CVG offered an opportunity to increase acceptability and engagement. Results suggest that the concept of a mental health CVG appears to be appealing to young adolescents and should be tested

<u>References</u>

Baumel, A., Edan, S., & Kane, J. M. (2019). Is there a trial bias impacting user engagement with unguided e-mental health interventions? A systematic comparison of published reports and real-world usage of the same programs. *Translational behavioral medicine, 9*(6), 1020-1033.

Bowman, N. D., Schultheiss, D., & Schumann, C. (2012). "I'm attached, and I'm a good guy/gal!": How character attachment influences pro-and anti-social motivations to play massively multiplayer online role-playing games. *Cyberpsychology, Behavior, and Social Networking, 15*(3), 169-174.

Brand, J. E., Jervis, S., Huggins P.M, (2019). *Digital New Zealand 2020*. Research report, *Everleight*, *NSW: IGEA*.

Brooks, F. M., Chester, K. L., Smeeton, N. C., & Spencer, N. H. (2016). Video gaming in adolescence: factors associated with leisure time use. *Journal of Youth Studies, 19*(1), 36-54.

Casual Games Association (2007). <u>https://www.org.id.tue.nl/IFIP-TC14/documents/CasualGamesMarketReport-2007.pdf</u>. <u>https://issuu.com/casualconnect/docs/casualgamesmarketreport-2007</u>(accessed November 18 2019).

Csikszentmihalyi M, Abuhamdeh S and Nakamura J (2014). Flow and the foundations of positive psychology. *Berlin: Springer*, pp.227–238.

Ebert, D. D., Zarski, A. C., Christensen, H., Stikkelbroek, Y., Cuijpers, P., Berking, M., & Riper, H. (2015). Internet and computer-based cognitive behavioral therapy for anxiety and depression in youth: a meta-analysis of randomised controlled outcome trials. *PloS one, 10*(3), e0119895.

Entertainment Software Association (2019). Essential facts about the computer and video game industry, www.theesa.com/esa-research/2019-essential-facts-about-the-computer-and-video-game-industry/ (2019, accessed January 16 2020).

Fleming, Stasiak, K., Moselen, E., Hermansson-Webb, E., Shepherd, M., Lucassen, M., Bavin, L. M., & Merry, S. N. (2019). Revising Computerized Therapy for Wider Appeal Among Adolescents: Youth Perspectives on a Revised Version of *SPARX*. Frontiers in Psychiatry, 10, 802–802. <u>https://doi.org/10.3389/fpsyt.2019.00802</u>

Fleming, T. M., Dixon, R. S., & Merry, S. N. (2012). 'It's mean!' The views of young people alienated from mainstream education on depression, help seeking and computerised therapy. *Advances in Mental Health, 10*(2), 195-203.

Fleming, Stasiak, K., Moselen, E., Hermansson-Webb, E., Shepherd, M., Lucassen, M., Bavin, L. M., & Merry, S. N. (2019). Revising Computerized Therapy for Wider Appeal Among Adolescents: Youth Perspectives on a Revised Version of *SPARX*. Frontiers in Psychiatry, 10, 802–802. https://doi.org/10.3389/fpsyt.2019.00802

Gulliver, A., & Griffiths, K. M., & Christensen, H.(2010). Perceived barriers and facilitators to mental health help-seeking in young people: A systematic review. *BMC Psychiatry, 10*(1), 113.

Hollis, C., Falconer, C. J., Martin, J. L., Whittington, C., Stockton, S., Glazebrook, C., & Davies, E. B. (2017). Annual Research Review: Digital health interventions for children and young people with mental health problems–a systematic and meta-review. *Journal of Child Psychology and Psychiatry, 58*(4), 474-503.

Kazantzis, N., Whittington, C., & Dattilio, F. (2010). Meta-analysis of homework effects in cognitive and behavioral therapy: A replication and extension. *Clinical Psychology: Science and Practice, 17*(2), 144.

Kultima, A. (2009, September). Casual game design values. In Proceedings of the 13th international *MindTrek conference: Everyday life in the ubiquitous era* (pp. 58-65).

Limelight Networks (2019). Market research: the state of online gaming – 2019, www.limelight.com/resources/white-paper/state-of-online-gaming-2019/ (2019, accessed January 12 2020).

Lockett, H., Lai, J., Tuason, C., Jury, A., & Fergusson, D. (2018). Primary healthcare utilisation among adults with mood and anxiety disorders: an analysis of the New Zealand health survey. *Journal of primary health care, 10*(1), 68-75.

Mohr, D. C., Burns, M. N., Schueller, S. M., Clarke, G., & Klinkman, M. (2013). Behavioral intervention technologies: evidence review and recommendations for future research in mental health. *General hospital psychiatry, 35*(4), 332-338.

Poutasi, K. ((2004). Ethnicity data protocols for the health and disability sector. *Wellington, New Zealand: Ministry of Health.*

Reinecke, L. (2009). Games at work: The recreational use of computer games during working hours. *CyberPsychology & Behavior, 12*(4), 461-465.

Scholten, H., & Granic, I. (2019). Use of the principles of design thinking to address limitations of digital mental health interventions for youth. *Journal of Medical Internet Research, 21*(1), e11528.

Stroud, M. J., & Whitbourne, S. K. (2015). Casual video games as training tools for attentional processes in everyday life. *Cyberpsychology, Behavior, and Social Networking, 18*(11), 654-660.

Thabrew, H., Fleming, T., Hetrick, S., & Merry, S. (2018). Co-design of eHealth interventions with children and young people. *Frontiers in psychiatry, 9*, 481.

Thomas, D. R. (2006). A general inductive approach for analysing qualitative evaluation data. *American journal of evaluation, 27*(2), 237-246.

Tuerk, P. W., Schaeffer, C. M., McGuire, J. F., Larsen, M. A., Capobianco, N., & Piacentini, J. (2019). Adapting evidence-based treatments for digital technologies: a critical review of functions, tools, and the use of branded solutions. *Current psychiatry reports, 21*(10), 1-13.

Varonis, E. M., & Varonis, M. E. (2015). Deconstructing candy crush: what instructional design can learn from game design. *The international journal of information and learning technology*.

Wilson, C. J., & Deane, F. P. (2001). Adolescent opinions about reducing help-seeking barriers and increasing appropriate help engagement. *Journal of Educational and Psychological Consultation, 12*(4), 345-364.

World Health Organization. (2018). *Depression and other common mental disorders: global health estimates* (No. WHO/MSD/MER/2017.2). World Health Organization.

Chapter Six: Study Three: Teachers' and Health Professionals' Attitudes towards Adolescent Mental Health and Digital Mental Health Interventions

Preamble

Studies One and Two explored the therapeutic potential of casual video games (CVGs) and the acceptability of using them to deliver mental health and well-being content among young adolescents. However, understanding teachers' and health professionals' perspectives on adolescent mental health and digital mental health interventions was an important next step.

Schooling is one of the few domains where almost all young adolescents participate (Ministry of Education, 2010). Subsequently, educational personnel, including teachers, have increasingly been expected to be responsible for more than students' learning, including supporting diverse well-being needs (Núñez Díaz, 2020). However, despite the number of hours teachers spend with students and the opportunities to provide general well-being support, there has been a lack of opportunities for teachers to upskill in this area (Núñez Díaz, 2020). Surveying teachers' opinions towards adolescent mental health and digital mental health interventions were, therefore, a useful way of gauging the importance of adolescent mental health as well as understanding how well digital tools might be accepted and thus recommended for young adolescents.

In terms of the rationale for recruiting health professionals, some research suggests that many health professionals are unaware of DMHIs for young people (Cummings, 2022). Of those who are, many are sceptical about the quality and usefulness of these approaches (Ebert et al., 2019). As stated in Chapter Two, these concerns are warranted given that the current literature is hampered with methodological issues and low retention rates. However, despite these limitations, therapists are becoming interested in delivering mental health support via technology (Cummings et al., 2022). Subsequently, the opinions of health professionals towards digital mental health interventions were important to explore, given the increasing need for scalable and non-face-to-face supports. The journal, Advances in Mental Health focuses on research that promotes mental health and has readers across a broad range of professions such as teachers, health professionals and researchers. Given that the implications of this research are particularly important for teachers who may be interested in capitalising on the potential of digital mental health tools, I deemed this journal an appropriate fit for publication.

Adjustments because of the COVID-19 pandemic

Before the emergence of the COVID-19 pandemic in New Zealand, I had gained ethical approval from the Victoria University of Wellington Ethics Committee (#0000026853) to conduct face-to-face focus groups with teachers and health professionals. The intent was to show stakeholders different digital mental health apps and CVG prototypes and gauge their interest; however, I adjusted my data collection methods and research question due to the implications of "social distancing" protocols. The focus of the study was then pivoted to explore teachers' and health professionals' attitudes towards adolescent mental health and digital mental health interventions through an anonymous online survey. This research method appeared to be an excellent fit with the central objectives of the study, given that rich data could still be obtained from key stakeholders about the project while also limiting face-to-face contact. However, there were also limitations to conducting the survey. For instance, I could not ask questions related to CVGs or probe for further information. Additional limitations are discussed at the end of this chapter.

Teachers' and Health Professionals' Attitudes towards Adolescent Mental Health and Digital Mental Health Interventions

Russell Pine Original Submission: 02.04.20 Revised Submission: 19.08.20

Abstract

Background: With the rapid rise in technology, digital mental health interventions (DMHIs) have been created across a range of platforms. Despite mixed consensus about their effectiveness and uptake, they may play a pivotal role in addressing barriers to accessing mental health support, particularly for adolescents. It is important to understand teachers' and health professionals' attitudes towards adolescent mental health and DMHIs as they may play key roles in supporting this population. *Aim*: The study aimed to explore teachers' and health professionals' attitudes on adolescent mental health and DMHIs. Method: A 2020 anonymous online survey consisting of five open-ended questions and one closed question was undertaken by a total of 98 participants (49 college teachers, 23 health school teachers, 21 psychologists, 3 school counsellors, and 2 social workers). *Results*: Teachers and health professionals identified the need for DMHIs to support adolescents in New Zealand with their mental health. Teachers and health professionals shared similar views about the advantages of using DMHIs, including increasing the accessibility of treatment and the need to use various approaches. Although participants expressed concerns about the lack of face-to-face contact with DMHIs, many were optimistic about using them. *Conclusion*: Teachers' and health professionals' attitudes towards adolescent mental health and DMHIs are important to consider when understanding the role these tools may play in school and therapeutic settings.

Introduction

Psychological distress and disorders such as anxiety and depression are highly prevalent, affecting approximately 290 million people worldwide (Friedrich, 2017). Adolescents, which for the purposes of the current study refer to those aged between 10 and 19 years of age, are at high risk for experiencing psychological disorders due to risk factors such as social isolation and an engagement in risk-seeking behaviours (Evans & Kim, 2007). In New Zealand (NZ), adolescents are more likely than adults to have elevated levels of psychological distress, with those living in the most socioeconomically deprived even more at risk (Ministry of Health, 2019). Despite effective treatments being available for psychological disorders, approximately 80% of individuals in low- and middle-income countries do not receive the treatment they require (Friedrich, 2017). Barriers to accessing services include the cost and availability of services and geographical isolation (Kohn et al., 2004)

Digital mental health interventions (DMHIs), which include computer-assisted therapy such as computerised cognitive behavioural therapy (CCBT), mobile "applications" and wearable technologies, may be able to address barriers to accessing treatment (Hollis et al., 2015). Popular examples of DMHIs which are human moderated include "*SPARX*", a cCBT game for helping young people who are feeling depressed (Fleming et al., 2012) and "MoodHacker" a mobile web app with email targeted at mild-moderate depression (Birney et al., 2016). As DMHIs can also be automated or use bots to deliver information via mobile and web-based platforms, adolescents can access digital supports anonymously and at a time that is convenient for them. Some adolescents have reported feeling more comfortable discussing sensitive and personal concerns when using DMHIs especially, in online contexts (Burns et al., 2010; Webb et al., 2008). With the accessibility, convenience and ubiquitous nature of digital technology, DMHIs are becoming a popular approach to support adolescent mental health (Weisel et al., 2019).

The evidence base for DMHIs is accumulating due to the rapid development of technology. However, current research on the effectiveness and uptake of DMHIs, appears mixed. In a recent systematic review examining the effectiveness of DMHIs for improving depression, anxiety, and psychological well-being among college students, Eysenbach et al. (2019) reported promising effects of DMHIs reducing mental health-related symptoms though simultaneously, many studies in the systematic review reported high rates of attrition and low

rates of sustained program use. In a recent meta-analysis investigating the efficacy of standalone smartphone apps for reducing mental health-related symptoms among children and adults, Weisel et al. (2019) reported no significant pooled effects sizes for anxiety, suicidal ideation, self-injury, or alcohol use apps ($g = -0.14$ to 0.18). Researchers suggested smartphone apps are yet to be delivered as standalone psychological interventions. As DMHIs vary across many dimensions, such as format and functionality, there is mixed consensus about the effectiveness and uptake of DMHIs. However, DMHIs may play a pivotal role in providing scalable and cost-effective mental health support to adolescents who do not seek out or receive treatment (Hollis et al., 2015)

Many adolescents spend approximately half of their waking time every day with peers and teachers (Prabhu & Shekhar, 2017). College teachers (refer to teachers who educate young people aged between 13 and 18 years of age in NZ) play an important role in the identification of mental health characteristics as well as timely referrals and recommendations (Meisel et al., 2018). In NZ, students are able to attend health schools across the country if they are physically or mentally unwell and unable to attend their usual school, are in a health-funded mental health program or are returning to their previous school after being away. Similar to college teachers, health school teachers play an essential role in teaching, supporting school transitions and supporting students to follow a health plan.

Health professionals such as psychologists and school counsellors may work one-on-one or in small groups supporting adolescents who experience psychological distress. Although health professionals can tailor evidence-based therapies to meet the individual's needs and preferences, there remains a gap between the demand for mental health services and supply, which is reflected in long wait times and therapists' high-stress levels (Kohn et al., 2004; Ministry of Health, 2019; Friedrich, 2017) Given the rapid pace of technology to facilitate the developed of DMHIs, it is possible digital interventions provide a feasible way of increasing service capacity by delivering support to a wide range of adolescents (Weisel et al., 2019)

The aim of the current study was to understand teachers' and health professionals' attitudes towards adolescent mental health and DHMIs, given their respective roles in supporting adolescents.

__Method__

2.1. Participants

A purposive sample of college teachers, health school teachers and health professionals (psychologists, school counsellors and social workers) across NZ consented to participate in the survey. Half of participants were college teachers 50% (n = 49), 23% (n = 23) were health school teachers, 21% (n = 21) were psychologists, 3% (n = 3 school counsellors) and 2% (n = 2) social workers.

2.2. Procedure

An email was sent to five Wellington locally based college principals with a study description and a survey link. Each college principal was invited to distribute the email among their staff, including college teachers and school guidance counsellors. Health school teachers were recruited through northern, central and southern health school principals in NZ using the same email sent to college principals. Health professionals were recruited through a posting on an online psychologist forum where information on the project and a link was provided.

2.3. Ethics and consent

Participants were first presented with an email outlining the purpose of the study, which included exploring teachers' and health professionals' attitudes towards adolescent mental health and digital mental health interventions for adolescents. The email also included the length of the study stating the survey would take between 5 and 10 minutes to complete. Once participants read the information, they clicked the survey link and were directed to the Victoria University of Wellington Qualtrics survey platform. When the link was opened, information about the survey and consent to take part in the study was presented to the participants. Ethics approval was obtained through the Victoria University of Wellington Ethics committee.

2.4. Survey development

The survey was developed on the Victoria University of Wellington Qualtrics survey platform. The six questions comprised of five open-ended questions and one closed question, allowed participants an opportunity to express their own ideas. The first three questions were designed to establish a general understanding of participants' attitudes and experiences toward adolescents' mental health. Following this, two questions were designed to elicit ideas about DMHIs, and one question was designed to understand general comments about the project. A list of all questions can be seen in Table 6.

2.5. Data analysis

Table 6

Themes and Examples of Comments Relating to Each Question

Question	Themes	Examples of comments
1. How important is adolescents' mental health to you?	Adolescents' mental health is important especially in New Zealand	"Extremely important", "The most important" "10/10 for young people in NZ", "In NZ, important!"
2. How confident are you to access mental health support for adolescents?	Health school teachers and health professionals know how to access mental health support, but barriers exist	"I know how to access but, there are such long waiting lists", "Confident but, don't believe young people will get support when they need it"
3. In your experience, do adolescents respond to similar mental health supports or, are a variety approaches needed?	Adolescents need a range of tools to support their mental health.	"There is no one size fits all approach", "They need different tools", "Every student is different, so they need different approaches"
4. What do you think about the idea of digital mental health interventions to help some adolescents?	Digital mental health interventions may play an important role but should not replace face-to-face contact	"Great idea", "Amazing", "Good if used with face-to face support". "Like it but human contact is important too"
5. How could your school or service use Digital mental health interventions	Participants were optimistic about using digital mental health interventions in their work.	"Could be used more in rural settings", "Reinforce concepts learnt in school", "As homework"
6. Do you have any further comments?	Participants wanted to learn more about digital mental health tools and provided suggestions	"interested in learning more", "important research and am interested to know more", "as long as they are used to help not to replace human contact"

A General Inductive Approach (GIA) proposed by Thomas (2006) is a systematic set of procedures used to analyse qualitative data. This approach was used in the current study to condense the raw textual data provided by participants' responses to the survey questions in a straightforward, reliable and valid manner. Author RP followed the GIA by closely reading the raw data from each question and clustering it into broad explicit and implicit themes. The overall theme for each question was summarised, with quotes from the raw data in italics. The survey platform forced a response from participants to progress to the next questions which helped to ensure there was no missing data.

Results

Question 1: How important is adolescent's mental health to you?

Theme: *Adolescent mental health is important*

All participants stated that adolescent mental health was important. Participants reported that adolescent mental health was important because it can impact various factors from learning to relationships. For instance, two health school teachers stated, "*mental health is so important,*

poor mental health affects their learning", "*young people cannot learn effectively or build friendships when their mental health is poor*". One college teacher reported, "*students are not able to fully engage with learning if they have mental health problems*". Two psychologists mentioned "*extremely important, mental health affects families and friends*" and "*mental health shapes how young people see the world, so it is very important*". Several participants were concerned about adolescent mental health, particularly in NZ. One health school teacher stated, "*this area is particularly important over the past 10 years when it seems more students than ever are suffering from anxiety and mental health problems, particularly in NZ*". One college teacher commented on the need to address mental health because of the alarming statistics in New Zealand "*NZ suicide stats are so worrying, especially for our young people*".

Question 2: How confident are you in accessing mental health support for adolescents?

Theme: *Health school teachers and health professionals know how to access mental health support, but barriers exist*

In general, health school teachers and health professionals were more confident than college teachers in accessing mental health support for adolescents. For instance, a psychologist and health school teacher mentioned, "*I am confident I know how to access support*" and "*yes pretty confident really*". However, college teachers were ambivalent about accessing mental health support and would refer students to the guidance counsellor if, they had one working in their college. Three college teachers mentioned, "*Maybe refer to the guidance counsellor but, not sure if we have one*", "*I used to refer to our guidance counsellor, but we don't have one anymore and not sure if I have the skill set or time*" and "*see I thought the guidance counsellor would help but that was back when we had one, now I don't know who to go to*". Although many health professionals and health school teachers were confident in accessing mental health support, they had concerns such as access to timely support in their region. Two health school teachers mentioned "*limited support in the geographical area*" and "*high demand has put a strain on professionals in this rural part of NZ so would be hard to get support when they need it*". Another health school teacher stated, "*I have been doing this job for 13 years and the last 5 years has been the hardest to access mental health services…students are waiting longer and longer for services*".

Question 3: In your experience, do adolescents respond to similar approaches or, are a variety of approaches needs to support their mental health?

Theme: *Adolescents need a range of tools to support their mental health*

Participants stated that in their experience, a variety of approaches are needed to best support adolescents' mental health. Two health school teachers reported "*there is no size fits all model to mental health*" and "*young people respond differently to different tools*". Two teachers mentioned, "*I think a variety of approaches is needed*" and "*I have had experience with my own 2 kids and they both use different tools*". A psychologist and social worker commented on the need to take into consideration individual preferences "*Young people like and dislike different things so I have used different approaches*" and "*every student uses different tools so important to have many tools in the toolbox*".

Question 4: What do you think about the idea of digital mental health interventions to help some adolescents?

Theme: *Digital mental health interventions may play an important role but should not replace face-to-face contact*

Most health school teachers, college teachers and health professionals reported DMHIs were "*excellent*", "*beneficial*" and "*essential*". The popularity of DHMIs was due in part, because digital tools are a modern medium for engaging adolescents. For example, two health school teachers stated, "*digital stuff is more engaging to teens and less confronting than talking therapies for some*" and "*digital technology is everywhere these days...maybe their preferred method of learning*". A college teacher mentioned, "*with the digital curriculum compulsory now, there is a real push towards learning about digital technologies so a good idea*". Accessibility was another benefit of using digital mental health tools. A school counsellor stated, "*you can use digital technology day or not, online or offline so why not used this stuff some of the time*". Some participants expressed concerns about the lack of face to face connection with DMHIs. Two health school teachers mentioned, "*digital technology needs to be used sparingly..... would not want them to promoting a problem rather than resolving one*" and "*digital connection can aggravate the situation*". Two psychologists mentioned that digital support could supplement face-to-face therapy or be used in different stages or treatment "*digital technology could be used with support from a therapist or used a homework component*", "*digital technologies could be used for lower-level mental distress*". One health school teacher echoed this idea "*it could be linked in with therapy later on to help them with harder parts....like homework in the health school*".

Question 5: How could your school or service use digital tools for mental health interventions?

Theme: *Participants were optimistic about the use of digital mental health interventions in their work*

Participants were optimistic about using DMHIs and had a variety of ideas about how they could integrate digital tools into their work. Health school teachers reported "*if young people are reluctant to talk to someone they could be used to bridge the gap*" "*good for rural based youth*", "*if it is part of a treatment plan we could help them with it*", "*could be homework and we help them with it in class*", "*part of the mental health plan*" " *to support a transition back into mainstream school*", "*many of our students have homework from psychologists including breathing exercises and regulating behaviour*" and "*Online tasks could be a way to help them access this at home*". College teachers stated "*it could be introduced in health classes or recommended by school counsellors with link on the school website*", "*good for another tool in the toolbox*", "*during form time, provide parents with info or during form time*" and "*use some fun videos*". Psychologists mentioned how they could fit into therapy, especially for rural-based youth "*they could be used alongside therapy*", " *'good for the rural youth I work with*" and "*could provide different options for those who live in isolated town and then they could pick one that they like*".

Question 6: Do you have any further comments?

Theme: *Participants wanted to learn more about digital mental health tools and provided suggestions*

Many health school teachers stated they were interested in DMHIs and would like to learn more "*Keen to use and see it*", "*Interested to learn more about the idea*", "*I think a digital mental health tool designed by students for students will be the way to go. Our students are moving so fast with the digital age they are the ones who truly know what they want from it*". One college teacher said, "*It's not a replacement for face-to-face help but, it could be another tool that young people could use*". One psychologist stated "*Digital mental health tools will be essential, just as online banking, shopping, social interaction and use of the cloud for storage has become. Digital media is all around us. Like it or not, it is here to stay and a powerful tool for supporting young people*".

Discussion

The aim of the current study was to understand teachers' and health professionals' attitudes towards adolescent mental health and DHMIs. Results suggest that participants place high importance on adolescent mental health, with some participants commenting on the impact psychological distress can have on factors such as learning and relationships. Teachers and health professionals commented on the need to support adolescents in NZ with their mental health. The most available statistics from the Ministry of Health (2019) in NZ state that the prevalence of psychological distress among young adults aged 15–24 is significantly higher than in adults aged 25 and over (14.5% compared to 4.2– 8.7%). It is not surprising that participants mentioned the impact psychological distress could have on other factors.

Research from longitudinal studies and systematic reviews have reported that adolescents who experience psychological distress are more likely to be excluded from school, experience poorer quality of life and experience more difficulties with academic work (Pascoe et al., 2020; Ribeiro et al., 2018; Tejerina-Arreal et al., 2020). Although participants stated adolescent mental health was important and understood the implications of psychological distress, college teachers were less confident than health school teachers and health professionals to access mental health support. It is possible college teachers were less confident in accessing mental health supports due to the increasing demands placed to focus on students' academic success (Fazel, et al., 2014). Although some college teachers may be able to effectively identify psychological distress among studentsit is important to provide time and training to upskill teachers in mental health care responsibilities such as referrals (Fazel et al., 2014; New Zealand Association of Counsellors, 2015). It is also important for college teachers to understand where they can access support as many college teachers in the current study expressed concerns over the accessibility of school counsellors. In NZ, one full-time school counsellor supports between 400 and 899 college students. Colleges which have less than 400 students share one full-time school counsellor New Zealand Association of Counsellors, (2015).

Although some students report feeling more comfortable talking with a school counsellor about mental health issues (Education Review Office, 2013), school counsellors are under continual pressure to support many students with a range of complex issues (Hughes, 2012).DMHIs could be a feasible way for school counsellors to address these issues by reaching many

adolescents waiting for face-to-face therapy or facilitating therapy by including DMHIs as part of a treatment plan (Weisel et al., 2019).

In the current study, health school teachers and health professionals stated they were confident in accessing mental health support for adolescents; however, barriers exist. Participants mentioned long waitlists, geographical accessibility and limited support for adolescents who are experiencing mild to moderate psychological distress were some of the barriers to accessing mental health support. The barriers identified by participants are consistent with systematic reviews (Cage et al., 2020; Garrido et al., 2019), which report the difficulties for adolescents in engaging in psychological support. Alternative ways to address these barriers are required as only 25–35% of children and adolescents who experiences psychological distress can access the support they need (Cage et al., 2020). DMHIs may be a promising approach to address these barriers for adolescents as they can be used immediately, across environments and for various levels of psychological distress (Stallard et al., 2010). DMHIs may also be another tool for teachers and health professionals to use with adolescents because, consistent with teachers' and health professionals' experience, various mental health tools are required to cater to adolescents' needs and preferences.

Participants stated that DMHIs might play an important role in supporting adolescents' mental health. Participants mentioned that DMHIs could be beneficial because many adolescents are familiar with digital technologies. With over 90% of adolescents owning or having access to a smartphone (Brand et al., 2019), DMHIs may be a preferred method of engagement for many adolescents. Although participants thought DMHIs were important, a lack of face-to-face contact with DMHIs was an identified concern. This lack of human contact with DMHIs is one of the most identified concerns (Stallard et al., 2010). Sweeney et al. (2015) investigated parental attitudes towards computer-based therapies for youth mental health.

Despite participants' concerns about the lack of face-to-face contact with DMHIs, teachers and health professionals were optimistic about the use of DMHIs. For instance, college teachers and health professionals mentioned that DMHIs could take on various roles such as reinforcing homework, supporting therapy sessions or helping support students who transition from health schools to mainstream educational environments. As research suggests human interaction can increase the effectiveness and engagement of DMHIs for some (Sweeney et al., 2017), it would

be interesting to explore how DMHIs and face-to-face therapy could be used together to support transitions across educational environments or reinforce concepts learnt in therapy.

Participants were interested to learn more about DMHIs and provided recommendations about different DMHIs. For example, one health teacher in the study suggested designing an app that measures anxiety levels fluctuating throughout the day would be a useful tool for some adolescents. With the rapid advances in technology, DMHIs are able to be created for a range of purposes across platforms.

Limitations

Although promising, the current study had several limitations. First, the survey did not record demographic information such as gender, age, experience or cultural background. It is possible this information may have helped contextualise the results and provided a deeper understanding of the themes. Second, questions were not piloted and may have been articulated in a misleading way which could have influenced the participant's response. Future research should pilot questions to ensure they are framed appropriately and reliably. Third, as this was a small-scale survey, it explored teachers' and health professionals' attitudes. Therefore, results are not designed to be generalised to other populations.

Conclusion

The current study suggests teachers and health professionals identify the need to support adolescent mental health and are positive about using DMHIs as they may address the high prevalence of psychological distress among NZ adolescents. Although participants were concerned about the lack of face-to-face contact with DMHIs, participants were interested to find out more about what tools are available. As participants wanted to know more about DMHIs, it is important to increase teachers' and health professionals' knowledge of evidence-based DMHIs. Ideas generated in the current study are important to consider when understanding the role of DMHIs for adolescents in different settings such as school and therapeutic settings.

References

Birney, A., Gunn, R., Russell, J., Ary, D., & Birney, A. (2016). Moodhacker mobile web app with email for adults to self-manage mild-to-moderate depression: Randomized controlled trial.JMIR MHealth and UHealth, 4(1), e8. doi:10.2196/mhealth.4231.

Brand, J. E., Jervis, J., Huggins, P. M., & Wilson, T. W. (2019). Digital New Zealand 2020. Eveleigh:IGEA.

Burns, M., Davenport, A., Durkin, A., Luscombe, M., & Hickie, B. (2010). The internet as a setting for mental health service utilisation by young people. Medical Journal of Australia, 192, S11.doi:10.5694/j.1326-5377.2010.tb03688.x

Cage, E., Stock, M., Sharpington, A., Pitman, E., & Batchelor, R. (2020). Barriers to accessing support for mental health issues at university. Studies in Higher Education (Dorchester-on- Thames), 45(8), 1637–1649. doi:10.1080/03075079.2018.1544237

Education Review Office. (2013). Improving guidance and counselling for students in secondary schools. Retrieved from http://www.ero.govt.nz

Evans, G., & Kim, P. (2007). Childhood poverty and health: Cumulative risk exposure and stress dysregulation. Psychological Science, 18(11), 953–957. doi:10.1111/j.1467-9280.2007.02008.x.

Eysenbach, G., Montague, E., Mishina, K., Gehring, N., Davies, E., Newton, A., & Graham, A. (2019). Digital mental health interventions for depression, anxiety, and enhancement of psychological well-being among college students: Systematic review. Journal of Medical Internet Research, 21(7), e12869. doi:10.2196/12869.

Fazel, M., Hoagwood, K., Stephan, S., & Ford, T. (2014). Mental health interventions in schools 1: Mental health interventions in schools in high-income countries. The Lancet Psychiatry, 1(5), 377–387. doi:10.1016/S2215-0366(14)70312-8

Fleming, T., Dixon, R., Frampton, C., & Merry, S. (2012). A pragmatic randomized controlled trial of computerized CBT (*SPARX*) for symptoms of depression among adolescents excluded from mainstream education. Behavioural and Cognitive Psychotherapy, 40(5), 529–541. doi:10.1017/S1352465811000695

Friedrich, M. (2017). Depression is the leading cause of disability around the world. JAMA, 317(15), 1517. doi:10.1001/jama.2017.3826.

Garrido, S., Millington, C., Cheers, D., Boydell, K., Schubert, E., Meade, T., & Nguyen, Q. (2019).What works and what doesn't work? A systematic review of digital mental health interventions for depression and anxiety in young people. Frontiers in Psychiatry, 10, 759. doi:10.3389/fpsyt.2019.00759

Hollis, C., Morriss, R., Martin, J., Amani, S., Cotton, R., Denis, M., & Hollis, C. (2015).Technological innovations in mental healthcare: Harnessing the digital revolution. The British Journal of Psychiatry: The Journal of Mental Science, 206(4), 263–265. doi:10.1192/bjp.bp.113.142612

Hughes, C. (2012). School counsellors, values learning, and the New Zealand curriculum. New Zealand Journal of Counselling, 32(2), 12–28. Retrieved from http://www.nzac.org.nz

Kohn, R., Saxena, S., Levav, I., Saraceno, B., & Kohn, R. (2004). The treatment gap in mental health care. Bulletin of the World Health Organization, 82(11), 858–866. doi:10.1590/S0042-96862004001100011

Meisel, S., Drury, H., & Perera-Delcourt, R. (2018). Therapists' attitudes to offering eCBT in an inner-city IAPT service: A survey study. Cognitive Behaviour Therapist, 11. doi:10.1017/S1754470X18000107

Ministry of Health (2018, November 14). New Zealand Health Survey. https://www.health.govt.nz/publication/annual-update-key-results-2018-19-new-zealandhealth-survey.

New Zealand Association of Counsellors. (2015). Do they make a difference? YES. http://www.nzac.org.nz/school_counsellors_making_a_difference.cfm

Pascoe, M., Hetrick, S., & Parker, A. (2020). The impact of stress on students in secondary school and higher education. International Journal of Adolescence and Youth, 25(1), 104–112. doi:10.1080/02673843.2019.1596823

Prabhu, S., & Shekhar, R. (2017). Resilience and perceived social support among school-going adolescents in Mangaluru. Indian Journal of Social Psychiatry, 33(4), 359–364. doi:10.4103/ijsp.ijsp_ 108_16

Ribeiro, Í, Pereira, R., Freire, I., de Oliveira, B., Casotti, C., & Boery, E. (2018). Stress and quality of life among university students: A systematic literature review. Health Professions Education, 4(2),70–77. doi:10.1016/j.hpe.2017.03.002.

Stallard, P., Richardson, T., & Velleman, S. (2010). Clinicians' attitudes towards the use of computerized cognitive behaviour therapy (cCBT) with children and adolescents. Behavioural and Cognitive Psychotherapy, 38(5), 545–560. doi:10.1017/S1352465810000421

Sweeney, G., Donovan, C., March, S., & Laurenson, S. (2015). Logging into therapy: Parent attitudes and intentions to use computer-based therapies for youth mental health. Internet Interventions –The Application of Information Technology in Mental and Behavioural, 2(4), 437–445. doi:10.1016/j.invent.2015.11.001.

Sweeney, G., Donovan, C., March, S., & Laurenson, S. (2017). Can we improve parent attitudes and intentions to access computer-based therapies for their children and adolescents? Child and Adolescent Mental Health, 22(3), 155–162. doi:10.1111/camh.12180

Tejerina-Arreal, M., Parker, C., Paget, A., Henley, W., Logan, S., Emond, A., & Ford, T. (2020). Child and adolescent mental health trajectories in relation to exclusion from school from the Avon longitudinal study of parents and children. Child and Adolescent Mental Health. doi:10.1111/camh.12367

Thomas, D. (2006). A general inductive approach for analyzing qualitative evaluation data. American Journal of Evaluation, 27(2), 237–246. doi:10.1177/1098214005283748.

Webb, M., Burns, J., & Collin, P. (2008). Providing online support for young people with mental health difficulties: Challenges and opportunities explored. Early Intervention in Psychiatry, 2 (2), 108–113. doi:10.1111/j.1751-7893.2008.00066.x

Weisel, K., Fuhrmann, L., Berking, M., Baumeister, H., Cuijpers, P., & Ebert, D. (2019). Standalone smartphone apps for mental health-a systematic review and meta-analysis. NPJ Digital Medicine, 2(1), 118. doi:10.1038/s41746-019-0188-8.

Chapter Seven: Development of a Casual Video Game (*Match Emoji*) with Psychological Well-Being Concepts for Young Adolescents

Preamble

Few researchers and mental health app developers have clearly outlined the design and development processes involved when creating digital mental health tools (DMHIs). This is problematic as the therapeutic components involved within these tools are often unclear, making it difficult to understand how the content in the intervention is derived from psychological and behavioural theories. Given this limitation commonly reported in the research, I wanted to clearly document the development process of *Match Emoji,* including how aspects of the game were refined through collaboration and research.

In contrast to 'typical' ways of developing DMHIs, as stated in Chapter Two, this research employed many novel strategies that improved the development process of *Match Emoji.* For example, I developed a 'key informant' group comprising seven young adolescents interested in the research from the beginning of Study Two. Rather than obtaining data from end-users at one point during the development of *Match Emoji*, targeted feedback related to the prototype was able to be collected at different stages. Integrating feedback from a small group of young adolescents through the development process led to greater acceptability of the tool that would not have been possible with a single co-design workshop.

It is important to note that in this chapter, there are some changes concerning the terminology used. For example, in **Study Two**, I refer to 'mental health casual video games'. However, many young adolescents suggested this way of talking about the game was 'too mental health focused'. Instead, after discussing the appropriateness of different terms to conceptualise the game with young adolescents, 'a casual video game *with* psychological well-being concepts' was a more accepted way of referring to the game. Another change that occurred after Study Two was in relation to the name of the specific prototype. In Study Two, the prototype was named '*Sparky',* an adaption from the CCBT programme *SPARX*. However, this was refined to *Match Emoji* as this name aligned more with the specific prototype of swiping and matching emojis.

Development of a Casual Video Game (*Match Emoji*) with Psychological Well-Being Concepts for Young Adolescents

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Abstract

Digital interventions for mental health and well-being have been shown to be effective in trials, yet uptake and retention in real-world settings are often disappointing. A more significant impact may be achieved by building interventions that are closer to how target groups use technology to support their own psychological well-being. Casual video games may be poised to offer an opportunity in this area as they are a highly popular activity among young people. We propose that mental health content can be integrated into the explicit content and the implicit processes used in casual video games. In this paper, we describe the design and core processes of *Match Emoji*, a casual video game designed to support the development of psychological well-being via gameplay and micro messages. The iterative development of *Match Emoji* involved various phases, including a systematic review of the literature, consultation with target users, clinicians, game developers and close reading of the literature. Expert collaboration was sought throughout the process to ensure gameplay and messages matched behaviour change and learning theories. An acceptability and feasibility study of *Match Emoji* will inform a randomised controlled trial in the future.

Introduction

Mental distress is common and appears to be increasing among adolescents globally (World Health Organisation, 2019; Son et al., 2020; Octavius et al., 2020). Evidence-based interventions for depression, anxiety, and other disorders exist (American Psychological Association, 2013; Te Pou o te Whakaaro Nui, 2016); however, most of those with disorders do not get professional help (Henderson et al., 2013), and those who require less intensive support often receive no professional intervention (Tylee et al., 2007). Early intervention and promoting psychological well-being may support the development of personal resources so that young people can fully participate in society (Sawyer et al., 2010) and may prevent later psychological distress and disorders (Keyes et al., 2010). Early intervention is likely to be cost-effective; for example, The New Zealand Ministry of Health estimated that every $1 spent on preventing psychological distress and disorders saved $7 in health care and $30 in productivity costs (Ministry of Health, 2019).

Digital technology offers scalable opportunities for mental health promotion and intervention. Computerised therapies, often based on cognitive behavioural therapy, are effective for treating anxiety and depression (Torok et al., 2020; Reilly et al., 2020; Luo et al., 2020) and may have a role in preventing depression (Calear et al., 2018). However, outside of trials, retention in computerised therapies has often been low (Baumel et al., 2019; Fleming et al., 2019). In recent years, briefer apps optimised for smartphones have proliferated. Systematic reviews of apps highlight that some of these are likely to be helpful, but most have not been tested (Reilly et al., 2020; Fleming et al., 2018). While a handful of apps appear to be highly appealing, with millions of downloads, many young people who might benefit from these do not access them.

Previous Work

We set out to explore alternative opportunities and processes. Based on observations that adolescents often used the internet in their unmoderated ways to support their psychological well-being we wanted to explore opportunities to build on or capitalise on adolescents' current online mood moderating behaviour, rather than beginning with adapting face-to-face models to online settings and asking users to adapt to those. We identified that 'unmoderated' internet use for mood or relaxation appeared to include the use of games, including relatively low-cost casual video games (CVGs). We carried out a systemic review of the literature related to the effects of CVGs on anxiety, depression, stress, and low mood (Pine et al., 2020a). From the 13 studies identified in the systematic review, 12 reported promising therapeutic effects of CVGs

on anxiety, depression, stress, and low mood. The included studies highlighted potential pathways and opportunities afforded by CVGs, such as flow and high levels of engagement.

Next, we conducted a scoping study to explore young adolescents' views of CVGs and their opinions of CVGs with mental well-being concepts, to help determine whether this idea was worthy of further investigation (Pine et al., 2020b). From the 207 participants aged between 13-15 years, many reported playing CVGs several times a week or day for various self-regulation purposes such as to help relieve stress or feel more relaxed. Participants were interested in the idea of a CVG with psychological well-being concepts. They provided recommendations such as using subtle psychological well-being content and creating an engaging interface with simple colours.

Following these promising findings, we aimed to develop a CVG to promote psychological well-being skills among adolescents aged 13-to-15 using conceptual analysis of therapeutic mechanisms of change, opportunities afforded by CVGs and co-design processes with young people.

Casual Video Games

Casual video games (CVGs) are games that are fun, quick to access, easy to learn and require no previous special videogame skills to play (Limelight Networks, 2019). Typically, CVGs are developed based on traditional game formats such as Pinball and Tetris and adapted for use on digital technologies, including smartphones and computers. CVGs vary among dimensions such as goals, genre, and time commitments. They involve various mechanisms and skills to progress through the game. For instance, matching puzzle-based games such as "Candy Crush" (Varonis & Varonis, 2015) involve lining up candies of matching colours to earn points and advance through the game.

According to The State of Online Gaming Report, (Limelight Networks, 2019) people play CVGs across demographics and report playing for various lengths of time and reasons. For instance, adults over 60 years of age report playing puzzle CVGs for extended periods of time and for social purposes. In comparison, younger adolescents such as those aged 13-to-15-years report playing CVGs 2-3 times a week in short bursts of time and prefer to play for reasons such as to relax and relieve stress (Pine et al., 2020b). The accessibility of CVGs, which can be played across devices and platforms at any time of day during various 'naturalistic' situations, such as waiting for a bus or stress-provoking environments, contributes to their

increasing popularity. Although CVGs are the most popular game worldwide, their inherent therapeutic potential has not been fully understood to support psychological well-being.

Theoretical Underpinnings

Based on the literature review and initial youth consultation, we proposed that CVGs offer flow, immersion and brief mood-enhancing distractions or a release from unpleasant experiences (Pine et al., 2020a). Many CVGs include advertisements and prompts to purchase greater gameplay options and increase game spending. We proposed that immersion and focusing might be harnessed for mental well-being purposes by including additional prompts through micro-messages to help the user slow down and notice what is happening internally and externally. It is hypothesised that helping players focus their attention and change cognitive processes will enhance their mood and be generalised to other environments.

CVGs can support the learning of new ideas and the integration of concepts and behaviours (Varonis & Varonis, 2015). We theorised that some groups of adolescents are open to learning psychological well-being concepts and ideas if presented in a simple and engaging way, for example, short micro- messages about simple skills coherently included in a CVG. We proposed that adolescents use CVGs despite advertisements. As such, replacing upgrades or in-game advertisements might be a novel and engaging idea. While there is little literature in this area, other researchers have supported the idea of brief micro-interventions (Baumel et al., 2019). The acceptability and face validity of very brief mental health was supported by our early youth engagement, where this linked to the gameplay experience (Pine et al., 2020b).

Study aim

Based on the literature review and youth interest, we aimed to develop a CVG to promote psychological well-being among adolescents aged 13-to-15. We utilised cultural, academic, and game development expertise throughout the design and development process. This paper discusses the design features and psychological and behaviour change processes of *Match Emoji* that aims to promote psychological well-being skills among young adolescents.

Methods

To design *Match Emoji*, a CVG with psychological well-being concepts, we used a participatory design framework involving the active participation of target users across each phase of development (Drain et al., 2018; Hetrick et al., 2018). This versatile and iterative design approach was supported with multi-disciplinary collaboration from international digital

mental health experts at key stages of development. The in-depth consultation was a strength of the design process as it allowed us to refine critical ideas such as the content involved in the micro-messages and ensure there was an optimal balance between psychological well-being skills and engaging gameplay.

To support re-developments and refining of *Match Emoji* during each phase, we consulted with a small and interested group of between 5-7 young adolescents. The small group of key informants expressed initial interest in the game following a presentation to a secondary school form class with 13-15-year-olds. Although small in size, the key informants provided insight into the design and development of the images, script, and dynamic message loading system. We employed different methods when consulting with the group to elicit feedback, such as focus groups and think-aloud interviews. Multiple methods helped to utilise diverse participants' skills and characteristics and ensured they felt comforTable sharing their thoughts and opinions. This led to a more productive design process. For example, through think-aloud interviews with key informants, we found that advertisements in CVGs were a common barrier to engagement as they were time-intensive and not relevant to the game. Subsequently, we replaced advertisements with short psychological well-being micro-messages that matched gameplay. Conversely, some participants preferred to provide honest feedback about the look and feel of the game in focus groups. This feedback helped to identify appropriate colours for the images.

Phase 1: Preferences Towards Casual Video Game Genres

Building upon the systematic review and scoping study results, we conducted in-depth consultation with 13-15-year-old adolescents to identify preferences towards CVG genres. As many different types of CVGs exist, we sought to understand which type of game was most popular. Consistent with previous research (Fleming et al., 2016) target users had diverse preferences. For example, many preferred simple match-three CVGs that require users to line up tiles or candies to earn points. In contrast, other adolescents preferred puzzle games such as Sudoku. Although preferences for CVGs among young adolescents varied, match-three games appeared to be the most popular type of CVG among 13-to-15-year-olds.

Phase 2: Design and Development of *Match Emoji*

Following phase 1, we aimed to create a new engaging CVG with psychological well-being concepts. However, given the typical budget of a CVG can vary from $10,000 to over $100,000

(Casual Video Games Association, 2020), we engaged a software developing company to identify how best to use the available funds. After initial collaboration with software developers and target users, we decided to purchase a popular modifiable match-three game similar to "Candy Crush" (Limelight Network, 2019). By purchasing an existing CVG, we were able to maintain engaging gameplay features, with minimal development cost, while being able to integrate psychological well-being concepts and ideas from target users.

To replace images and advertisements in the game, we used an agile design process involving collaboration with experts and consultation with behaviour change and learning theories. Once iterations had been created, we tested *Match Emoji* in a series of cycles known as "sprints" with target users (Thabrew et al., 2018). Through the design process, we formulated micro-messages to replace advertisements in the game. These messages were based upon a combination of psychological well-being theories. The two primary theories involved were the Five Ways to Wellbeing (Mackay et al., 2019) and the Discoverer, Noticer, Advisor and Values (DNA-V) model of behaviour change (Hayes & Ciarrochi, 2016). The Five Ways to Wellbeing are simple daily practices for individuals to improve their well-being that include connect, be active, take notice, keep earning, and give. The DNA-V model aims to support adolescents in managing emotions, connecting with their values, using mindfulness, and developing healthy relationships (Ciarrochi et al., 2016). Although all core processes of each model were not used within the game; both theories provided a basis for formulating messages as both theories are culturally and developmentally appropriate for young adolescents in New Zealand (Mackay et al., 2019; Hayes & Ciarrochi, 2015; Ciarrochi et al., 2016; Pine, 2020).

The micro-messages were checked with experts who had knowledge of the behaviour change models and were changed accordingly from their feedback. Following the development of micro-messages, images were created for each message and key aspects within the game. For example, emojis were created to replace candies. Throughout each sub-phase, we were able to consult with a well-defined group of young adolescents who were familiar with CVGs and interested in playing *Match Emoji*. This consultation enabled quick feedback to be obtained to shape the development of the game.

Match Emoji

The goal of *Match Emoji* is to match similar coloured emojis together to earn points and progress through the game. The six different coloured and shaped emojis in the game as seen in Figure 6, represent digital expressions of emotions, ideas, and personality (Zhu, 2015). After

the user has successfully matched the required number of emojis, which can last from 30 seconds to over 3 minutes or, has failed to match the required emojis in the time limit, a micro-message appears on the screen. Each micro-message is delivered via a dynamic messaging loading system that helps to identify the 'optimal' time to display the message. Hints are used throughout the game if players get stuck. For example. if the player waits to long before making a move, *Match Emoji* identifies a potential combination of similar coloured emojis by moving a successful sequence of items back and forth to capture the user's attention. As the game progresses, users are required to *Match Emoji*s in a fixed amount of time and identify different combinations with special types of emojis. Therefore, although hints are useful at the beginning of the game, they may not necessarily be the best option as the game progresses. Figure 7 illustrates a typical gameplay session.

Figure 6

Emojis that represent the six emotions within the game.

Figure 7

Game Play

The following section details the design features and psychological and behavioural change processes of *Match Emoji*.

Script for Micro-Messages

The original CVG purchased used advertisements in the form of short videos after each level. Through multi-disciplinary collaboration and preliminary interviews with young adolescents, we decided to replace advertisements with micro-messages. The initial script for the micro-messages was formulated by the first and last author (RP and TF). The script was adjusted accordingly from feedback obtained in the form of qualitative interviews with key informants. Recommendations involved suggestions such as "*Provide a light level of mental health content*", "*Do not be heavy handed on the messages*". "*I like the noticing character but needs a cool image*" and "*the simple 5 tips thing seems like you could actually do them pretty easily*".

Psychological well-being literature, specifically the Five Ways to Wellbeing and the DNA-V model, was referred to support the development and refining of the script. We consulted with international digital mental health experts and psychologists to seek their professional opinions and ensure the script included the optimal balance between engaging gameplay and psychological well-being content. An example of four micro-messages can be seen in Table 7 with a screenshot of how the micro-message appear in the game in Figure 8.

Table 7

Script For Match Emoji

Welcome to Match Emoji a simple matching game to help relax the mind
Sometimes things suck and it affects our well-being
We might feel like poop sometime or we might feel great!
Doing something simple like talking to a friend can uplift our mood

Figure 8

Example Of Micro-Message In The Game
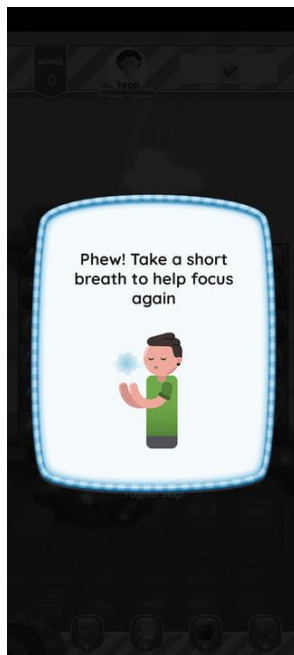
Software developers created a dynamic message loading system to enable micro-messages to be stored, retrieved, and modified on a secure platform. This system provided an opportunity to rapidly test the delivery of each micro-message with target users and quickly incorporate feedback from experts and the literature. For instance, target users could provide feedback on the preferred length of time a certain message was displayed on the screen. Once the optimal amount of time had been identified, and the system created the change, the adjustment appeared in *Match Emoji* after an internet connection was established. It is important to note that an internet connection is only required to download the game and the most recent changes from the dynamic loading system. The following features contribute to the dynamic loading system and can be seen in Table 8.

Identification number: A unique number given to each micro-message.

Micro-message: The micro message delivered in the game consists of between 4 to 15 words.

Type: Each micro-message is split into two categories: Concepts that involves messages related to psychological well-being, or game events which are related to how the user is currently engaging with game e.g., how many wins or loses they have had.

Set: A series of closely related messages that have a similar learning objective. There are 9 sets of messages within *Match Emoji*.

Pause: length of time the message is displayed on the screen for in seconds. This ranges from 3-10 seconds.

Table 8

Dynamic Message Loading Features

Sequence number	Micro-message	Type	Set	Sequence	Pause
26	*Phew! Take a small breath to help reset and try again.*	Concept	4	6	7
27	*Nice job you are getting the hang of this!*	Game event	4	7	3
28	*Some parts are easy and are some are just hard!*	Concept	4	8	3
29	*Welcome back to the game did you use your discoverer and try something new?*	Game event	4	9	5

Images

After the micro-message and dynamic loading system were created, we engaged a design expert to create images for the game as seen in Figure 9. The design expert worked closely with the multi-disciplinary team to ensure images aligned with the purpose of micro-messages, the current aesthetics of the game, and the overall objectives for each message set. Frequent meetings with the design expert were involved in enhancing the iterative process and in clarifying goals. Mock images were checked with key informants to ensure images matched target users' preferences.

Figure 9

Character Created for Match Emoji

Flow

Flow is a state of dynamic equilibrium which occurs when a challenge is equal to the individual's skill level (Csikszentmihalyi, 2014). When applied to CVGs, research suggests this type of game is ideally poised to produce a state of flow—challenge, clear rules and goals, immediate feedback, and the ability to increase in difficulty (Nakamura & Csikszentmihaly, 2002). *Match Emoji* uses this mechanism by matching the users' skill level with the presented challenge. This involves increasing the difficulty of matching emojis to align and challenge the user's skill set. For instance, after users have been able to navigate the challenges presented in the first five levels successfully, players must match similar coloured emojis under a time constraint. This time constraint forces the player to try different strategies and make more complex decisions to advance through the game.

Learning Theories

Each micro-message in *Match Emoji* is assigned to one of nine different message sets. Each message set has a series of specific learning objectives that gradually increase in complexity. For instance, the first set of micro-messages aims to orientate players to the game and normalise difficult thoughts and emotions. As players progress and learn psychological well-being skills, they are encouraged to try skills during the game. For example, users are asked to notice what is happening around them or within their bodies when they lose a level.

Concepts learnt in one section of the game are used later in the game with others or on a subsequent level to support the learning of psychological well-being skills.

Spacing and interleaving key ideas require more effort from the learner to recall previously encountered information in the game (Rawson & Dunlosky, 2013). However, the more cognitive resources required for the learner to retrieve information, the more likely this information is stored in their long-term memory (Birmbaum et al., 2013). An example of interleaving and spacing psychological well-being skills within *Match Emoji* is "*Sometimes taking a slow breath can help chill us out*". In subsequent message sets, users are presented with "*Phew! Take a small breath to help reset and try again*". This message is also displayed on the screen for a longer period to allow the user to practise the skill of breathing slowly.

The gap between one's current skill level and potential skill level is known as the zone of proximal development (ZPD) (Malik et al., 2017). Learning opportunities that align with an individual's current skill level, known as scaffolding, facilitate development through the ZPD. The ZPD and scaffolding align with the mechanisms that underpin *Match Emoji*. For instance, during the first ten levels, players encounter simple concepts to match young adolescents' current knowledge of psychological well-being skills. These short messages provide the building blocks for more complex learning in subsequent message sets and levels. Images, reminders and challenges provide scaffolding and facilitate the progress of learning through the ZPD.

Discussion

Overall, we have described the design features and psychological and behaviour change processes of *Match Emoji*, a casual video game designed to support the development of psychological well-being via gameplay and micro messages. The iterative design involved participatory design procedures with young adolescents and multi-disciplinary collaboration with software developers, designers, health professionals and digital mental health experts. A systematic review of the literature and scoping study of target users' preferences supported the emerging rationale for a CVG with psychological well-being content.

Strengths

The agile design approach adopted to create *Match Emoji* involved several strengths. First, target users provided valuable input into key design decisions across the entire design process.

For example, the design expert created mock images for the character and emojis. These images were checked with a small group of target users who provided their opinions and preferences on the aesthetics. From this feedback, we were able to work collaboratively with the design expert to create the necessary adjustments and ensure images were engaging. Slattery and colleagues (Slattery et al., 2020) suggest that involving target users in the design of health interventions should be standard procedure. This is because researchers can better understand users' needs, create a more engaging intervention, and continue educating end-users about future interventions (Bruinessen et al., 2017; Thabrew et al., 2018). We found that actively involving and consulting with 5-7 young adolescents was beneficial for obtaining focused and genuine content. By integrating feedback from target users we hope to improve the likelihood of engagement with *Match Emoji* in 'real-world' settings.

Another strength to the development of *Match Emoji* involved the input from key stakeholders and experts at multiple stages. Multi-disciplinary consultation enabled us to seek expert guidance across various domains. For example, iterations in the code for *Match Emoji* were handled by software developers while mental health practitioners provided input into the content and purpose of each message. The benefit of adopting this design approach allowed us to quickly navigate challenges and meet tight deadlines for each sub-phase of work. This ultimately facilitated the development of images, micro-messages, and a dynamic messaging system. A growing amount of research has highlighted the essential role multi-disciplinary collaboration plays in the design of digital mental health tools (Aboujaoude & Gega, 2019; Guo et al., 2020). This is in part, due to the various skill sets that are required to work towards the same mutual goal. Collaboration with key stakeholders is therefore fundamental for a well-designed and executed health intervention (Guo et al., 2020).

From the initial stages of the project, we sought to create an intervention which closely related to how 13-to-15 years olds currently use technology to support their own psychological well-being. Consistent with research, we found smartphone usage was high among young adolescents and was most often associated with playing CVGs. For instance, the average smartphone owner uses approximately 10 apps per day and 30 apps each month (Limelight Networks et al., 2019). With smartphone users typically dipping in and out of apps, many users are unlikely to engage with digital health interventions that are time intensive. In fact, systematic reviews and user analytics suggest many digital mental health tools have limited uptake after they have been downloaded (Fleming et al., 2016).

Considering the most downloaded category of apps are games, specifically CVGs, we thought this might be an appealing mode of engagement. As such, we used the idea of CVGs with behaviour change and learning theories to create a short micro-message centred around simple psychological well-being skills. Because content is highly focused and the time frame for playing the game is shorter than typical digital mental health tools (Baumel et al., 2020), it is possible this may create a digital mental health tool that fits with how people currently use technology.

<u>Limitations</u>

We consulted with target users throughout each phase of the design and development process. During the first phase of development, we consulted with over 200 young adolescents across seven different schools. This large-scale consultation provided valuable input into the type of CVGs and prototypes; however, as individual classrooms involved between 20-30 students, we often obtained conflicting feedback and suggestions. In a recent rapid review of co-design approaches in health, Slattery and colleagues (2020) suggest there is a paucity of research on the effects of group size on co-design interventions for health. Further, guidelines have yet to be developed around the ideal group size for focus groups and co-design workshops. Nevertheless, small and frequent consultation with end-users is often recommended to fully understand users' preferences (Thabrew et al., 2018). Therefore, we adjusted our methodological approach in subsequent phases of the project and consulted with a smaller group of young adolescents.

When we embarked on developing *Match Emoji*, we were mindful of the potentially addictive functionalities games use to engage users for long periods. There have been several studies exploring the potentially aversive and addictive qualities of games (Huesmann, 2010; Starčević & Billieux, 2018). When people spend a large part of their day gaming, this pattern of behaviour can increase the chances of experiencing problems with peers and demonstrating aggressive behaviours (Mihara & Higuchi,2017). Spending large amounts of time gaming or on screens can become excessive when it replaces healthy behaviours such as physical activity and sleep; however, The World Health Organization (2020) recently provided guidelines for the usage of technology. These guidelines suggest it is important to use technology that involves playing games in 'moderation'. It is also particularly important to ensure the young person's safety online. As *Match Emoji* is a CVG played off-line and designed to be played for 5-15 minutes at a time, the game appears to be a suiTable match with current technology guidelines. Further, we did not include functionalities that are associated with more harmful

and addictive aspects of gaming, such as violence, compulsion loops or online features. These functionalities were excluded from the design to ensure users engage with the game as it is intended for – short 5-15-minute sessions at a time.

Next steps

Our next steps are to conduct an acceptability and feasibility study of *Match Emoji* with young adolescents in New Zealand secondary schools (Pine et al., 2021). Information from this study will provide feedback on the design and functionalities of the game and potentially inform the design of a more robust evaluation approach such as a randomised controlled trial.

References

Aboujaoude, E., & Gega, L. (2019). From Digital Mental Health Interventions to Digital "Addiction": Where the Two Fields Converge. Frontiers in Psychiatry, 10, 1017–1017. https://doi.org/10.3389/fpsyt.2019.01017.

American Psychiatric Association (2013). Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-V). Arlington, VA: American Psychiatric Association.

Baumel, A., Fleming, T., & Schueller, S. (2020). Digital Micro Interventions for Behavioral and Mental Health Gains: Core Components and Conceptualization of Digital Micro Intervention Care. Journal of Medical Internet Research, 22(10), e20631–e20631. https://doi.org/10.2196/20631.

Baumel, A., Muench, F., Edan, S., & Kane, J. M. (2019). Objective user engagement with mental health apps: Systematic search and panel-based usage analysis. Journal of Medical Internet Research, 21(9), e14567. https://doi.org/10.2196/14567

Beurs, D., Bruinessen, I., Noordman, J., Friele, R., & Dulmen, S. (2017). Active Involvement of End Users When Developing Web-Based Mental Health Interventions. Frontiers in Psychiatry, 8, 72–72. https://doi.org/10.3389/fpsyt.2017.00072

Birnbaum, M.S., Kornell, N., Bjork, E.L. *et al.* Why interleaving enhances inductive learning: The roles of discrimination and retrieval. *Mem Cogn* 41, 392–402 (2013). https://doi.org/10.3758/s13421-012-0272-7

Calear, A. (2018). 24.1 Evaluation of the MoodGym and *SPARX*-R Online Depression Prevention Programs in Schools. *Journal of the American Academy of Child and Adolescent Psychiatry, 57*(10), S35–S35. https://doi.org/10.1016/j.jaac.2018.07.151.

Ciarrochi, J., Atkins, P., Hayes, L., Sahdra, B., & Parker, P. (2016). Contextual Positive Psychology: Policy Recommendations for Implementing Positive Psychology into Schools. *Frontiers in Psychology, 7*, 1561–1561. https://doi.org/10.3389/fpsyg.2016.01561

Csikszentmihalyi, M. (2014). Applications of Flow in Human Development and Education: The Collected Works of Mihaly Csikszentmihalyi (2014th ed.). Springer Netherlands. https://doi.org/10.1007/978-94-017-9094-9

Drain, A., Shekar, A., & Grigg, N. (2018). Participatory Design with People with Disability in Rural Cambodia: The Creativity Challenge. *The Design Journal*, *21*(5), 685–706. https://doi.org/10.1080/14606925.2018.1488923.

Fleming, T., Bavin, L., Lucassen, M., Stasiak, K., Hopkins, S., & Merry, S. (2018). Beyond the trial: Systematic review of real-world uptake and engagement with digital self-help interventions for depression, low mood, or anxiety. *Journal of Medical Internet Research, 20*(6). https://doi.org/10.2196/jmir.9275

Fleming, T., Bavin, L., Lucassen, M., Stasiak, K., Hopkins, S., & Merry, S. (2018). Beyond the Trial: Systematic Review of Real-World Uptake and Engagement With Digital Self-

Help Interventions for Depression, Low Mood, or Anxiety. *Journal of medical Internet research*, *20*(6), e199. https://doi.org/10.2196/jmir.9275

Fleming, T., Merry, S., Stasiak, K., Hopkins, S., Patolo, T., Ruru, S., Latu, M., Shepherd, M., Christie, G., & GoodyearSmith, F. (2019). The Importance of User Segmentation for Designing Digital Therapy for Adolescent Mental Health: Findings From Scoping Processes. *JMIR Mental Health, 6*(5), e12656. https://doi.org/10.2196/12656

Global strategy on digital health 2020-2025. Geneva: World Health Organization; 2021. Licence: CC BY-NC-SA 3.0 IGO.

Guo, C., Ashrafian, H., Ghafur, S. et al. Challenges for the evaluation of digital health solutions—A call for innovative evidence generation approaches. npj Digit. Med. 3, 110 (2020). https://doi.org/10.1038/s41746-020-00314-2.

Hayes, L., & Ciarrochi, J. (2015). *The thriving adolescent: using acceptance and commitment therapy and positive psychology to help teens manage emotions, achieve goals, and build connection*. Oakland: Context Press, an imprint of New Harbinger Publications, Inc.

Henderson, C., Evans-Lacko, S., & Thornicroft, G. (2013). Mental illness stigma, help seeking, and public health programs. *American journal of public health, 103*(5), 777–780. https://doi.org/10.2105/AJPH.2012.301056

Hetrick, S., O'Connor, D., Stavely, H., Hughes, F., Pennell, K., Killackey, E., & McGorry, P. (2018). Development of an implementation guide to facilitate the roll-out of early intervention services for psychosis. *Early Intervention in Psychiatry*, *12*(6), 1100–1111. https://doi.org/10.1111/eip.12420.

Huesmann, L. (2010). Nailing the Coffin Shut on Doubts That Violent Video Games Stimulate Aggression: Comment on Anderson et al. (2010). Psychological Bulletin, 136(2), 179–181. https://doi.org/10.1037/a0018567.

Keyes, C. L., Dhingra, S. S., & Simoes, E. J. (2010). Change in level of positive mental health as a predictor of future risk of mental illness. *American journal of public health*, *100*(12), 2366–2371. https://doi.org/10.2105/AJPH.2010.192245

Limelight Networks. (2019, March 15). Market Research: The State of Online Gaming – 2019. Retrieved April 16, 2021, from https://www.limelight.com/resources/whitepaper/state-of-online-gaming-2019/.

Luo, C., Sanger, N., Singhal, N., Pattrick, K., Shams, I., Shahid, H., Hoang, P., Schmidt, J., Lee, J., Haber, S., Puckering, M., Buchanan, N., Lee, P., Ng, K., Sun, S., Kheyson, S., Chung, D. C.-Y., Sanger, S., Thabane, L., & Samaan, Z. (2020). A comparison of electronically delivered and face to face cognitive behavioural therapies in depressive disorders: A systematic review and meta-analysis. *EClinicalMedicine, 24*, 100442. https://doi.org/https://doi. org/10.1016/j.eclinm.2020.100442.

Mackay, L., Egli, V., Booker, L., & Prendergast, K. (2019). New Zealand's engagement with the Five Ways to Well-being: evidence from a large cross-sectional survey. *Kōtuitui*, *14*(2), 230–244. https://doi.org/10.1080/1177083X.2019.1603165

Malik, S. A. (2017). Revisiting and re-representing scaffolding: The two gradient model. Cogent Education, 4(1), 1331533–. https://doi.org/10.1080/2331186X.2017.1331533

Mihara, S., & Higuchi, S. (2017). Cross-sectional and longitudinal epidemiological studies of Internet gaming disorder: A systematic review of the literature. Psychiatry and Clinical Neurosciences, 71(7), 425–444. https://doi.org/10.1111/pcn.12532.

Ministry of Health. (2021). Annual Update of Key Results 2018/19: New Zealand Health Survey. https://www. health.govt.nz/publication/annual-update-key-results-2018-19-new-zealand-health-survey.

Nakamura, J., & Csikszentmihalyi, M. (2002). The concept of flow. In C. R. Snyder & S. J. Lopez (Eds.), Handbook of positive psychology (p. 89–105). Oxford University Press.

Octavius, G., Silviani, F., Lesmandjaja, A., Angelina, & Juliansen, A. (2020). Impact of COVID-19 on adolescents' mental health: a systematic review. *Middle East Current Psychiatry (Cairo)*, *27*(1), 1–8. https://doi.org/10.1186/s43045-020-00075-4

Oliver, K., Collin, P., Burns, J., & Nicholas, J. (2006). Building resilience in young people through meaningful participation. Australian e-Journal for the Advancement of Mental Health AeJAMH, 5(1), 34–40. https://doi.org/10.5172/jamh.5.1.34.

Pine, R. (2020): Your life, your way: acceptance and commitment therapy skills to help teens manage emotions and build resilience, *Advances in Mental Health*, DOI: 10.1080/18387357.2020.1860691.

Pine, R., Fleming, T., McCallum, S., & Sutcliffe, K. (2020). The Effects of Casual Videogames on Anxiety, Depression, Stress, and Low Mood: A Systematic Review. *Games for Health, 9*(4), 255–264. https://doi.org/10.1089/g4h.2019.0132

Pine, R., Mbinta, J., Te Morenga, L., & Fleming T., (2021). A Casual Video Game With Psychological Well-being Concepts for Young Adolescents: Protocol for an Acceptability and Feasibility Study. JMIR Research Protocols, 10(8), e31588–e31588. https://doi.org/10.2196/31588.

Pine, R., Sutcliffe, K., McCallum, S., & Fleming, T. (2020). Young adolescents' interest in a mental health casual video game. *Digital Health*. https://doi.org/10.1177/2055207620949391.

Rawson, K., & Dunlosky, J. (2013). Relearning Attenuates the Benefits and Costs of Spacing. Journal of Experimental Psychology. General, 142(4), 1113–1129. https://doi.org/10.1037/a0030498.

Reilly, R., Stephens, J., Micklem, J., Tufanaru, C., Harfield, S., Fisher, I., Pearson, O., & Ward, J. (2020). Use and uptake of web-based therapeutic interventions amongst Indigenous populations in Australia, New Zealand, the United States of America and

Canada: A scoping review. Systematic Reviews, 9(123). https://doi.org/10.1186/s13643-020-01374-x.

Sawyer, M., Harchak, T., Spence, S., Bond, L., Graetz, B., Kay, D., Patton, G., & Sheffield, J. (2010). School-Based Prevention of Depression: A 2-Year Follow-up of a Randomized Controlled Trial of the beyondblue Schools Research Initiative. *Journal of Adolescent Health*, *47*(3), 297–304. https://doi.org/10.1016/j.jadohealth.2010.02.007.

Slattery, P., Saeri, A.K. & Bragge, P. Research co-design in health: a rapid overview of reviews. *Health Res Policy Sys* 18, 17 (2020). https://doi.org/10.1186/s12961-020-0528-9

Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on College Students' Mental Health in the United States: Interview Survey Study. *Journal of Medical Internet Research, 22*(9), e21279–e21279. https://doi.org/10.2196/21279

Starčević, V., & Billieux, J. (2018). Precise estimates of gaming-related harm should guide regulation of gaming: Commentary on: Policy responses to problematic video game use: A systematic review of current measures and future possibilities (Király et al., 2018). Journal of Behavioral Addictions, 7(3), 522–525. https://doi.org/10.1556/2006.7.2018.54

Te Pou o te Whakaaro Nui (2016). Therapy: A guide to evidence-based talking therapies. Auckland, New Zealand: Te Pou o te Whakaaro Nui.

Thabrew, H., Fleming, T., Hetrick, S., & Merry, S. (2018). Co-design of eHealth Interventions With Children and Young People. *Frontiers in Psychiatry, 9*, 481–481. https://doi.org/10.3389/fpsyt.2018.00481

Thabrew, H., Fleming, T., Hetrick, S., & Merry, S. (2018). Co-design of eHealth Interventions With Children and Young People. Frontiers in Psychiatry, 9, 481–481. https://doi.org/10.3389/fpsyt.2018.00481.

Torok, M., Han, J., Baker, S., Werner-Seidler, A., Wong, I., Larsen, M. E., & Christensen, H. (2020). Suicide prevention using self-guided digital interventions: a systematic review and meta-analysis of randomised controlled trials. The Lancet Digital Health, 2(1), e25–e36. https://doi.org/10.1016/S2589-7500(19)30199-2

Tylee, A., Haller, D., Graham, T., Churchill, R., & Sanci, L. (2007). Youth-friendly primary-care services: how are we doing and what more needs to be done? *The Lancet (British Edition), 369*(9572), 1565–1573. https://doi.org/10.1016/S0140-6736(07)60371-7

Varonis, E., & Varonis, M. (2015). Deconstructing Candy Crush: what instructional design can learn from game design. The International Journal of Information and Learning Technology, 32(3), 150–164. https://doi.org/10.1108/IJILT-09-2014-0019

World Health Organization. (2019). World health statistics 2019: monitoring health for the SDGs, sustainable development goals. World Health Organization.

Zhu, X. (2015). *A symbolism study of expression in text-based communication*. ProQuest Dissertations Publishing.

Chapter Eight: A Pilot Study of *Match Emoji*

Preamble

In Chapter Seven, I detailed the development of *Match Emoji* and discussed the therapeutic processes that underpin the game. However, I had yet to explore if *Match Emoji* was an acceptable prototype for delivering mental health and well-being for young adolescents using robust methods. Therefore, a pilot study of *Match Emoji* with pre and post measures including semi-structured interviews was an appropriate way to test this idea and complete the systematic programme of research.

Before undertaking the pilot study, I developed a research protocol for two primary reasons. First, creating the protocol provided an opportunity to clearly articulate the objectives, design, methodology, statistical considerations and identify potential challenges before the trial began. Anticipating challenges, such as restrictions on face-to-face gatherings, helped me adjust my research process quickly when needed. Second, the protocol provided a systematic guide that I could consult throughout the pilot study. This guide was essential given my limited knowledge of conducting trials, the ramifications of the COVID-19 pandemic, and the need to pivot the research process for recruiting participants.

Importantly, since the development of the protocol, I re-examined the appropriateness of using the terms acceptability and feasibility to conceptualise this study. Researchers such as Whitehead et al. (2014) argue that there are no clear criteria for defining feasibility and pilot studies. Nevertheless, it is generally agreed upon that feasibility studies refer to studies that estimate the essential parameters needed to design the primary research, such as participants' willingness to be randomised and follow-up rates (Whitehead et al., 2014). While some of these factors were considered in the trial, there was less attention on these aspects in comparison with what is typically expected. Instead, I was more interested in exploring the acceptability of *Match Emoji* and the potential therapeutic effects. This focus aligned more with a pilot study, given the aim of these studies, are to mimic the trial design and are intended to enhance further works. As such, the aims I had implicitly wanted to explore appeared to align more with a 'pilot study than that of acceptability and feasibility study after completing the protocol. Thus, in Part One and Part Two of this chapter, they are some inconsistencies in the way I discuss the study, which reflects my learning.

In the first part of this chapter, I present the protocol in manuscript form or the acceptability and feasibility study of *Match Emoji*. Although the protocol was initially created and formatted for the Health and Ethics Disability Committee (HDEC), it has been modified to include an abstract, introduction, results and discussion section. In the second part of this chapter, I report on the small open trial of *Match Emoji* with 45 adolescents (12-15-years-olds) from two New Zealand secondary schools and one intermediate school. I present this research in manuscript form as it has been prepared for submission as of February 2022.

Part One: A Casual Video Game with Psychological Well-Being Concepts for Young Adolescents: Protocol for an Acceptability and Feasibility Study

Russell Pine, James Mbinta, Lisa Te Morenga and Theresa Fleming Original Submission: 27.6.21 Revised Submission: 08.6.21

Abstract

Background: Many face-to-face and digital therapeutic supports are designed for adolescents experiencing high levels of psychological distress. However, promoting psychological well-being among adolescents is often neglected despite significant short-term and long-term benefits. *Objectives*: This research has 3 main objectives: (1) to assess the acceptability of *Match Emoji*, a casual video game with psychological well-being concepts among 13-15-year-olds in a New Zealand secondary school (2) to identify the feasibility of the research process (3) to explore the preliminary well-being and therapeutic potential of *Match Emoji*. *Method*: Approximately 40 participants aged 13–15-years from a local secondary college in Wellington, New Zealand, will be invited to download and play *Match Emoji* 3-4 times a week for 5-15 minutes over a 2-week period. Participants will complete 4 assessments at baseline, post-intervention and 3 weeks later to assess psychological well-being and therapeutic changes. Statistical analysis will be used to synthesize data from interviews and triangulated with assessment changes and game analytics. This synthesis will help to assess the acceptability and feasibility of the *Match Emoji*. *Results*: The key outputs from the project will include the acceptability, feasibility, and therapeutic potential of *Match Emoji*. *Conclusion*: Data from the study is expected to inform future research on *Match Emoji*, including a randomized control trial and further adjustments to the design and development of the game.

Introduction

In New Zealand, an increasing number of young people experience elevated levels of psychological distress and low well-being (Every-Palmer et al., 2020). Although treatments such as cognitive behavioural therapy exist and have shown promise for reducing clinical levels of psychological distress (Andrews et al., 2018; Nixon et al., 2013), supports for promoting psychological well-being are often underutilized despite their therapeutic potential (Funmi et al., 2020; Ruini et al., 2009; Boehm et al., 2015).

Young adolescents, aged between 13-15-years, are particularly vulnerable to experiencing elevated levels of psychological distress and low well-being (Kessler et al., 2005; Loewen et al., 2019). This is partly due to the additional external and internal demands placed on young adolescents from navigating puberty to forming gender norms and health and well-being attitudes (Kågesten et al., 2016; Lane et al., 2017). To compound rapid developmental changes, young adolescents enter a more complex educational environment while forging new relationships with peers and family members. As approximately half of all mental ill health starts by age 15 and 75% develops by age 18 (Kessler et al., 2005), it is vital to create interventions that will promote psychological well-being skills among young adolescents.

Young adolescents in New Zealand who have access to the curriculum are provided with opportunities to learn mental health and well-being skills such as stress management and resilience skills (Ministry of Education, 2007; Fitzpatrick et al., 2020). Although education through the curriculum is a promising preventive measure (Fitzpatrick et al., 2020; Kutcher et al., 2016), longitudinal research suggests more targeted supports are required to promote psychological well-being among young adolescents (Clark et al., 2012).

Given the popularity of digital technologies, a plethora of digital mental health interventions (DMHIs) have been created and shown promise for elevating psychological distress and promoting psychological well-being in trial settings (Armaou et al., 2019; Lehtimaki et al., 2020; Garrido et al., 2019). This scalable and low-cost approach is promising for young people considering the potential to bypass traditional barriers such as stigma and time (Renton et al., 2014; Kass Et al., 2017; Lattie et al., 2019). However, recent systematic reviews and meta-analysis report DMHIs are yet to reach their full engagement potential with low real-world use of many popular mental health apps (Garrido et al., 2019; Fleming et al., 2018).

A growing amount of research has attempted to identify ways in which to increase the adherence of DMHIs among young people (Garrido et al., 2019; Liverpool et al., 2020). One promising approach is using micro-interventions. The goal of micro-interventions is to enable users to work towards a highly focused goal with support from in-the-moment elements such as reminders and nudges (Baumel et al., 2020).

A popular activity among many young people that utilises similar underlying mechanics of micro-interventions is casual video games (CVGs). Globally, CVGs such as "Bejewelled" and "Angry Birds" are played by millions of people in short bursts of time (Casual Video Games Association, 2020). According to a recent systematic review of the literature, CVGs may also hold promising therapeutic mood-enhancing and brief releases from unpleasant experiences (Pine et al., 2020a). Previous research with young adolescents suggests CVGs are a popular approach among this age group who commonly play these games to distract and "calm a busy mind". (Pine et al., 2020b).

Based on the systematic review of the literature and research with young adolescents, we created *Match Emoji*, a CVG with psychological well-being concepts. Although it is important to evaluate core psychotherapeutic components of interventions to understand how specific elements guide the design of the intervention as a whole, Meinlschmidt et al., 2016), it is more beneficial to investigate the potential for real-world usage in naturalistic settings Fleming et al., 2018; Meinlschmidt et al., 2016). As such, the aim of the current protocol is: (1) to assess the acceptability of *Match Emoji* among 13-15-year olds in a New Zealand secondary school (2) to identify the feasibility of the research process (3) to explore the preliminary well-being and therapeutic potential of *Match Emoji*.

Method

Research Strategy
This study will employ a mixed-methods design to assess the acceptability, feasibility, and therapeutic potential of a CVG with psychological well-being concepts among 13–15-year-olds.

Study Design
The study will involve three phases. First, we will recruit 13-15-year-old students from two to four classrooms from a local secondary school within the Wellington region of New Zealand.

Once participants have returned their consent and assent forms, they will be asked to download *Match Emoji* onto their phone or digital device. During the second phase, participants will be encouraged to play the game 3-4 times a week for 5-15 minutes for a 2-week period. Game play time and sessions will be collected through the Unity platform to help inform the feasibility and acceptably of the recommended game play. During the third phase, researchers will follow up 2 weeks after the recommended regimen of *Match Emoji* and collect secondary outcomes measures (from the CAMM, GHSQ, FS and RCADS) followed by short interviews with participants about their experience.

Study Population

Approximately 40 students from a local secondary school in Wellington, New Zealand, will take part in playing *Match Emoji* 3-4 times a week for 5-15 minutes over a 2-week period. Participants will be invited from year 9 and 10 classrooms and are typically between 13-15 years of age. As this is an acceptability and feasibility study, a total of 40 participants will provide a large enough sample size to show a meaningful difference in the primary and secondary outcomes between baseline, post intervention and a 3 week follow up.

Inclusion Criteria

Young people will be included in the study if they are between the ages of 13 to 15, have provided written consent from a parent or caregiver, and are able to understand and sign the assent form.

Exclusion and Safety Criteria

Young people will be excluded from participation if they do not meet the inclusion criteria. The appropriate personnel within the secondary school will be engaged if a participant self-reports a high levels of mental health need. This will be determined through the four questionnaires. Those participants who are engaged with existing therapeutic support are able to participate in the research study if the consent has been obtained from the young person.

Intervention

Match Emoji is a match-three CVG with psychological-being concepts designed for young adolescents. The aim of *Match Emoji* is to match similar coloured emojis together to earn points and progress through the game. There are a total of six different coloured and shaped emojis which represent a unique digital expression such as an emotion, idea, or personality. When the

user has successfully matched the required number of emojis with a fixed number of moves or time frame, a micro-message appears on the screen. Each micro message consists of a short psychological well-being concept such as "*notice what is going on around you*" or "*sometimes talking to a friend can help*" and is delivered via a dynamic messaging loading system that identifies the 'optimal' time to display the message. Hints are used throughout the game if players get stuck. For example, if the player waits too long before making a move, *Match Emoji* identifies a potential combination of similar coloured emojis by moving a successful sequence of items back and forth to capture the user's attention. An example of the game can be seen in Figure 10.

Figure 10

Game Map

<u>*Outcome Measures*</u>

The primary outcomes of the study are (1) acceptability of *Match Emoji* (ie, is *Match Emoji* acceptable among young adolescents), as assessed via a short semi-structured intervention with participants after the recommended regime of game play and game analytics including the number of sessions and minutes played recorded via the Unity platform (2) feasibility of *Match Emoji* (ie, is it easy to complete the study with young adolescents within a secondary school context) as measured by the number of students interested to participate in completing the four questionnaires, playing the recommended regimen of *Match Emoji* and attending the follow up interview.

The secondary outcome (measured at baseline before accessing *Match Emoji*, on completing the two weeks of recommended game play, and on the three-week follow-up) is efficacy (ie. does *Match Emoji* promote psychological well-being skills). This will be assessed by measuring changes of time from the Child and Adolescent Mindfulness Measure (CAMM), General Help-Seeking Questionnaire (GHSQ), Flourishing Scale (FS) and Revised Children's Anxiety and Depression Scale (RCADS). It is estimated to take participants approximately 10 to 15 minutes to complete all questionnaires.

The CAMM is a 10-item measure of mindfulness for use with children and adolescents and has been reported to have good internal consistency and significant correlations between CAMM scores and measures of psychological functioning and distress (Kuby et al., 2015). The GHSQ is a one-page questionnaire with 2 sets of questions that examines the respondent's likelihood of seeking help for a specific issue such as psychological distress. The GHSQ has been reported to have good reliability and validity and appears to be a flexible measure of help-seeking intentions that can be applied to different contexts age groups including young people (Olivari et al., 2017).

The 8-item Flourishing Scale (FS) is a valid and reliable brief summary measure of psychological well-being suited for young people (Diener et al., 2009; Schotanus-Dijkstra et al., 2016). The scale provides a single psychological well-being score derived from the eight questions and has been used as an effective measure to access adolescents' psychological well-being in the New Zealand secondary school context (Hone et al., 2014). The RCADS is a youth self-report questionnaire with 6 subscales, including separation anxiety disorder and low mood. The RCADS has good reliability on subscales and total scale (Chorpita et al., 2005), internal consistency and good convergent validity (Esbjørn et al., 2012). The RCADS has been used as an appropriate and easy to administer assessment tool of anxiety and depressive symptoms in several populations within New Zealand (Esbjørn et al., 2012; Radez et al., 2020).

Interviews lasting approximately 30 minutes will take place with no more than 6 participants at one time to understand experiences of playing *Match Emoji*. Interviews will be conducted by the first author (RP) at the local school in a familiar setting to the participants. Responses will be recorded in a paper-based format. Questions will involve 1) What parts of the game did you like? 2) What parts of the game could be improved? 3) What did you learn from playing the game? 4) Did you try and use any of the ideas from the game and if so, which ones? 5) Do you think you will continue to play *Match Emoji*? Interviews will not involve more than 6

participants at a time. At the end of the interview, participants will be able to read and correct answers.

Statistical Analysis

Quantitative data from the four assessments and gameplay usage will be analyzed using Microsoft Excel, Statistical Software Package (SPSS) version 26 and the metrics recorded from the Unity platform, including the number of sessions and minutes played (IBM, 2019; Unity Technologies, 2019). Analyses will include descriptive statistics (e.g., number of sessions completed, number of minutes played, changes in assessment scores, and socio-demographic characteristics of the participants).

As this is an acceptability and feasibility study, a sample size of 40 participants will be a large enough sample to show a meaningful difference in primary and secondary outcomes between baseline and the end of the interview. A Chi-square test and t test will be used to assess the statistical significance of changes in the four assessment scores over time. A *P*-value of less than .05 will be used at the 95% confidence level to determine the therapeutic potential of any difference between pre- and post-measures. NVivo will be used to store and code qualitative data from the interviews with participants. A general inductive approach will be used by researchers to identify and analyse emerging themes (Thomas, 2006).

Ethics and Consent

This study received ethics approval from the New Zealand Health and Disability Ethics Committee (21/NTA/34) on the 28th of May 2021. After the college principal or senior management staff member has understood and approved the research, participants will be provided with information about the study. Students will be provided with time to ask questions before deciding to make an informed decision about their voluntary participation through an assent form. A consent form will also be required from the parent or guardian.

All the project data and materials sent for publication will be de-identified by removing statements identifying participants. Participants who disclose mental health needs which meet the threshold for a clinical diagnosis will be handled by the appropriate school personnel such as school counsellor. The data will be stored securely in a password-protected computer accessible only to the research team. The de-identifiable findings will be included in first authors (RP's) doctoral thesis as well as being disseminated through peer-reviewed academic

journals, national and international conferences, and public events. If parents ask for their child's individual results such as game analytics, we will seek permission from the child first.

Results

Recruitment of participants started in June 2021 with completion anticipated to be completed by July 2021. It is anticipated that participants will have finished playing the recommended game play regimen by August 2021 with analysis of results completed by October 2021. The key outputs from the game will inform future design and iterations of the game. In addition, a larger and more robust methodological approach such as a randomized control may be created to fully understand the therapeutic effects of *Match Emoji*.

Discussion

Promoting psychological well-being among young adolescents may support overall health and improved disease-specific outcomes later in life (Ong et al., 2011; Diener & Chan, 2011; DeStemp et al., 2013). Given the potential benefits of promoting psychological well-being coupled with a heightened risk of experiencing elevated levels of psychological distress, it is crucial to explore engaging preventive tools for young adolescents (Tang et al., 2019). This is particularly important in New Zealand, where a growing number of young people have reported experiencing psychological distress (Clark et al., 2013).

Conclusion

The current acceptability and feasibility study aimed to assess the acceptability of *Match Emoji* among 13-15-year-olds in a New Zealand secondary school, identify the feasibility of the research process and examine the psychological well-being and therapeutic potential of the game. The study's primary outcomes will help shape the iterative design process of *Match Emoji* and understand if the game is worthy of more rigorous testing in a randomized controlled trial. The secondary outcomes will examine the psychological well-being and therapeutic potential of *Match Emoji*. If *Match Emoji* is shown in subsequent studies to be acceptable and useful for young adolescents in its final form, it is hoped that the game may be promoted and available free of charge to young people in New Zealand on the google and apple play store.

References

Andrews G, Bell C, Boyce P, et al. Royal Australian and New Zealand College of Psychiatrists clinical practice guidelines for the treatment of panic disorder, social anxiety disorder and generalised anxiety disorder. *Australian & New Zealand Journal of Psychiatry*. 2018;52(12):1109-1172. doi:10.1177/0004867418799453

Armaou M, Konstantinidis S, Blake H. The Effectiveness of Digital Interventions for Psychological Well-Being in the Workplace: A Systematic Review Protocol. *International Journal of Environmental Research and Public Health*. 2019;17(1):255. doi:10.3390/ijerph17010255

Baumel A, Fleming T, Scheuller SM. Digital Micro-Interventions for Behavioral and Mental Health Gains: Core Components and Conceptualization of Digital Micro-Intervention Care (Preprint). *Journal of Medical Internet Research*. Published online May 24, 2020. doi:10.2196/20631

Bidargaddi N, Schrader G, Klasnja P, Licinio J, Murphy S. Designing m-Health interventions for precision mental health support. *Translational Psychiatry*. 2020;10(1). doi:10.1038/s41398-020-00895-2

Boehm JK, Trudel-Fitzgerald C, Kivimaki M, Kubzansky LD. The prospective association between positive psychological well-being and diabetes. *Health Psychology*. 2015;34(10):1013-1021. doi:10.1037/hea0000200

Chorpita BF, Moffitt CE, Gray J. Psychometric properties of the Revised Child Anxiety and Depression Scale in a clinical sample. *Behaviour Research and Therapy*. 2005;43(3):309-322. doi:10.1016/j.brat.2004.02.004

Clark T, Fleming T, Bullen P, et al. Health and well-being of secondary school students in New Zealand: Trends between 2001, 2007 and 2012. *Journal of Paediatrics and Child Health*. 2013;49(11):925-934. doi:10.1111/jpc.12427

Clement J. Global share of casual gamers by age 2019. Statista. Published 2021. Accessed June 25, 2021. https://www.statista.com/statistics/1128710/casual-video-gamers-age/

DeSteno D, Gross JJ, Kubzansky L. Affective science and health: The importance of emotion and emotion regulation. *Health Psychology*. 2013;32(5):474-486. doi:10.1037/a0030259

Diener E, Chan MY. Happy People Live Longer: Subjective Well-Being Contributes to Health and Longevity. *Applied Psychology: Health and Well-Being*. 2011;3(1):1-43. doi:10.1111/j.1758-0854.2010.01045.x

Diener E, Wirtz D, Tov W, et al. New Well-being Measures: Short Scales to Assess Flourishing and Positive and Negative Feelings. *Social Indicators Research*. 2009;97(2):143-156. doi:10.1007/s11205-009-9493-y

Esbjørn BH, Sømhovd MJ, Turnstedt C, Reinholdt-Dunne ML. Assessing the Revised Child Anxiety and Depression Scale (RCADS) in a National Sample of Danish Youth Aged

8–16 Years. Scott JG, ed. *PLoS ONE*. 2012;7(5):e37339. doi:10.1371/journal.pone.0037339

Every-Palmer S, Jenkins M, Gendall P, et al. Psychological distress, anxiety, family violence, suicidality, and wellbeing in New Zealand during the COVID-19 lockdown: A cross-sectional study. Francis JM, ed. *PLOS ONE*. 2020;15(11):e0241658. doi:10.1371/journal.pone.0241658

Fitzpatrick KM, Harris C, Drawve G. How bad is it? Suicidality in the middle of the COVID-19 pandemic. *Suicide and Life-Threatening Behavior*. 2020;50(6):1241-1249. doi:10.1111/sltb.12655

Fleming T, Bavin L, Lucassen M, Stasiak K, Hopkins S, Merry S. Beyond the Trial: Systematic Review of Real-World Uptake and Engagement With Digital Self-Help Interventions for Depression, Low Mood, or Anxiety. *Journal of Medical Internet Research*. 2018;20(6):e199. doi:10.2196/jmir.9275

Funmi T-B, Modupe T, Oluwasegun O. Promoting Psychological Wellbeing across the Life Span: Prospects and Challenges in Nigeria. *Journal of Psychology & Behavior Research*. 2020;2(1):p43. doi:10.22158/jpbr.v2n1p43

Garrido S, Millington C, Cheers D, et al. What Works and What Doesn't Work? A Systematic Review of Digital Mental Health Interventions for Depression and Anxiety in Young People. *Frontiers in Psychiatry*. 2019;10. doi:10.3389/fpsyt.2019.00759

Hone LC, Jarden A, Schofield G, Duncan S. Measuring flourishing: The impact of operational definitions on the prevalence of high levels of wellbeing. *International Journal of Wellbeing*. 2014;4(1):62-90. doi:10.5502/ijw.v4i1.4

IBM. SPSS software. Ibm.com. Published 2019. https://www.ibm.com/analytics/spss-statistics-software

Kågesten A, Gibbs S, Blum RW, et al. Understanding Factors that Shape Gender Attitudes in Early Adolescence Globally: A Mixed-Methods Systematic Review. Dalby AR, ed. *PLOS ONE*. 2016;11(6):e0157805. doi:10.1371/journal.pone.0157805

Kass AE, Balantekin KN, Fitzsimmons-Craft EE, Jacobi C, Wilfley DE, Taylor CB. The economic case for digital interventions for eating disorders among United States college students. *International Journal of Eating Disorders*. 2017;50(3):250-258. doi:10.1002/eat.22680

Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Archives of General Psychiatry*. 2005;62(6):593-602. doi:10.1001/archpsyc.62.6.593

Kuby AK, McLean N, Allen K. Validation of the Child and Adolescent Mindfulness Measure (CAMM) with Non-Clinical Adolescents. *Mindfulness*. 2015;6(6):1448-1455. doi:10.1007/s12671-015-0418-3

Kutcher S, Wei Y, Coniglio C. Mental Health Literacy. *The Canadian Journal of Psychiatry*. 2016;61(3):154-158. doi:10.1177/0706743715616609

Lane C, Brundage CL, Kreinin T. Why We Must Invest in Early Adolescence: Early Intervention, Lasting Impact. *Journal of Adolescent Health*. 2017;61(4):S10-S11. doi:10.1016/j.jadohealth.2017.07.011

Lattie EG, Adkins EC, Winquist N, Stiles-Shields C, Wafford QE, Graham AK. Digital Mental Health Interventions for Depression, Anxiety, and Enhancement of Psychological Well-Being Among College Students: Systematic Review. *Journal of Medical Internet Research*. 2019;21(7):e12869. doi:10.2196/12869

Lehtimaki S, Martic J, Wahl B, Foster KT, Schwalbe N. Evidence on digital mental health interventions for adolescents and young people: A systematic overview (Preprint). *JMIR Mental Health*. Published online November 18, 2020. doi:10.2196/25847

Liverpool S, Mota CP, Sales CMD, et al. Engaging Children and Young People in Digital Mental Health Interventions: Systematic Review of Modes of Delivery, Facilitators, and Barriers. *Journal of Medical Internet Research*. 2020;22(6):e16317. doi:10.2196/16317

Loewen OK, Maximova K, Ekwaru JP, et al. Lifestyle Behavior and Mental Health in Early Adolescence. *Pediatrics*. 2019;143(5):e20183307. doi:10.1542/peds.2018-3307

Meinlschmidt G, Lee J-H, Stalujanis E, et al. Smartphone-Based Psychotherapeutic Micro-Interventions to Improve Mood in a Real-World Setting. *Frontiers in Psychology*. 2016;7:1112. doi:10.3389/fpsyg.2016.01112

Ministry of Education (2007). *The New Zealand Curriculum for English-Medium Teaching and Learning in Years 1-13*.

Nixon RDV. Simos, G., & Hofmann, S. G. (2013). CBT for anxiety disorders: A practitioner book. Oxford: Wiley-Blackwell. *Clinical Psychologist*. 2014;18(2):98-98. doi:10.1111/cp.12042

Olivari C, Guzmán-González M. Validación del cuestionario general de búsqueda de ayuda para problemas de salud mental en adolescentes. *Revista chilena de pediatría*. 2017;88(3):324-331. doi:10.4067/s0370-41062017000300003

Ong AD, Mroczek DK, Riffin C. The Health Significance of Positive Emotions in Adulthood and Later Life. *Social and Personality Psychology Compass*. 2011;5(8):538-551. doi:10.1111/j.1751-9004.2011.00370.x

Pine R, Fleming T, McCallum S, Sutcliffe K. The Effects of Casual Videogames on Anxiety, Depression, Stress, and Low Mood: A Systematic Review. *Games for Health Journal*. 2020;9(4). doi:10.1089/g4h.2019.0132

Pine R, Sutcliffe K, McCallum S, Fleming T. Young adolescents' interest in a mental health casual video game. *DIGITAL HEALTH*. 2020;6:205520762094939. doi:10.1177/2055207620949391

Radez J, Waite P, Chorpita BF, et al. Using a brief 11-item version of the RCADS to identify anxiety and depressive disorders in adolescents. Published online August 5, 2020. doi:10.31234/osf.io/a42gw

Renton T, Tang H, Ennis N, et al. Web-Based Intervention Programs for Depression: A Scoping Review and Evaluation. *Journal of Medical Internet Research*. 2014;16(9):e209. doi:10.2196/jmir.3147

Ruini C, Ottolini F, Tomba E, et al. School intervention for promoting psychological well-being in adolescence. *Journal of Behavior Therapy and Experimental Psychiatry*. 2009;40(4):522-532. doi:10.1016/j.jbtep.2009.07.002

Schotanus-Dijkstra M, ten Klooster PM, Drossaert CHC, et al. Validation of the Flourishing Scale in a sample of people with suboptimal levels of mental well-being. *BMC Psychology*. 2016;4(1). doi:10.1186/s40359-016-0116-5

Tang Y-Y, Tang R, Gross JJ. Promoting Psychological Well-Being Through an Evidence-Based Mindfulness Training Program. *Frontiers in Human Neuroscience*. 2019;13. doi:10.3389/fnhum.2019.00237

Thomas, D. (2006). A general inductive approach for analyzing qualitative evaluation data. American Journal of Evaluation, 27(2), 237–246. doi:10.1177/1098214005283748.

Unity Technologies. Unity - Unity. Unity. Published 2019. https://unity.com/

Part Two: Study Four: A pilot study of a casual video game with psychological well-being concepts (*Match Emoji*) for young adolescents.

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Abstract

Background: Young adolescents aged between 10-15 have a high level of unmet mental health needs across New Zealand. With the increasing challenges for this population, such as the implications of the COVID-19 pandemic and climate change, an array of engaging mental health and well-being approaches is urgently required.

Objectives: This pilot study has three main objectives: (1) to assess the acceptability of *Match Emoji*, a casual video game adapted to deliver mental health and well-being concepts (2) to identify the feasibility of the research process (3) to explore the preliminary well-being and therapeutic potential of *Match Emoji*.

Method: Young adolescents (45: 57% New Zealand European, 26% Māori, 60% Male) aged 12–14-were recruited from one secondary school and two intermediate schools in the Wellington region of New Zealand. Each participant completed a Child and Adolescent Mindfulness Measure (CAMM), General Help-Seeking Questionnaire (GHSQ), Flourishing Scale (FS) and Revised Children's Anxiety and Depression Scale (RCADS) at baseline and after two weeks of following the recommended gameplay regime of *Match Emoji*. After the study, qualitative data was analyzed from participants through a general inductive approach. This data was combined with game analytics recorded on the Unity Platform.

Results: Most participants reported that *Match Emoji* was an acceptable game, with participants playing longer than recommended. Methods for recruiting participants were modified to meet the COVID-19 pandemic restrictions; however, promising data related to the acceptability, the feasibility of the research process and therapeutic potential of *Match Emoji* was obtained.

Conclusion: *Match Emoji* appears to be an acceptable mechanism for delivering mental health and well-being content among young adolescents in New Zealand.

Introduction

Longitudinal research has documented the continued level of mental distress and low well-being among adolescents (Clark et al., 2018; Peiris-John et al., 2020; Racine et al., 2021). Given this alarming trend coupled with the unprecedented worldwide ramifications of the ongoing COVID-19 pandemic and climate change, adolescents' mental health has never been more threatened (Fusar-Poli et al., 2021; Neufeld et al., 2017).

Treatments such as cognitive behaviour therapy (CBT) and psychotropic medication are recommended for young people experiencing high levels of distress (Cleare et al., 2015; Skehan & Davis, 2017). Preventative programmes that aim to buffer against higher levels of distress later in life also exist for young people (Wilson et al., 2001). Nevertheless, several structural and attitudinal barriers inhibit access to mental health support for many young people (Mojtabai et al., 2011). Furthermore, those young people with mild-to-moderate levels of psychological distress may not access treatments and support from the public health care system as their needs are not deemed severe enough (Sheppard et al., 2018).

Digital mental health interventions (DMHIs) refer to specialised content, support, or therapy for mental health conditions delivered electronically to treat, elevate, or manage symptoms (Torous et al., 2018). These tools address some of the shortcomings of treatments. For example, DMHIs can be used by young people irrespective of their level of distress, and they can be scaled up at a low cost due to their reduced reliance on clinically trained professionals (Fairburn & Patel, 2017). In addition, randomised controlled trials of DHMIs for mental health have shown promising therapeutic potential across various age groups (Garrido et al., 2019).

Although this method of delivering mental health content is promising, engagement with DMHIs outside of trial settings is poor (Fleming et al., 2018). Some of the reasons for this poor uptake are due to the mismatch between how end-users currently engage with technology and the requirements of the specific tool (Baumel et al., 2020; Fleming et al., 2016), the lack of appeal and novelty of the content for the target group (Donkin et al., 2011), and the slow design from conception to development. Therefore, while DMHIs have a great capacity to address mental health needs, new solutions to improve engagement are required for them to deliver on their promising potential (Donkin et al., 2011).

The use of casual video games (CVGs) as an acceptable and feasible medium for delivering mental health and well-being content has been underexplored, surprising given their popularity and relative simplicity. CVGs can be played in short bursts of time, require no specialized skills and are often free to download and play(Consumer Acquisition, 2020). Well-known CVGs include 'Rise Up' and 'Angry Birds'. Globally, 'Rise Up' has been downloaded over ten million times on the Google Play Store, and Angry Birds is played for approximately 200 million minutes each day (Brand et al., 2020; Percy, 2018).

Given the sustained popularity of these games, we explored how to enhance psychological well-being in young adolescents using a CVG-based intervention. This investigation began by synthesizing the research on the therapeutic potential of CVGs through a systematic review of the literature (Pine et al., 2020a). Findings from the literature coupled with young adolescents', health professionals' and teachers' experiences suggested this idea was promising. We therefore designed and developed *Match Emoji*, a CVG adapted to deliver mental health and well-being concepts for young adolescents (Pine et al., 2020b). This study aimed to explore (1) the acceptability of *Match Emoji* among young adolescents in New Zealand (2) the feasibility of the research process (3) the preliminary well-being and therapeutic potential of *Match Emoji.*

Methods

Ethical Approval

This study received ethics approval from the New Zealand Health and Disability Ethics Committee (21/NTA/34) on May 28, 2021.

Design

The study used a mixed-methods design to assess the acceptability, feasibility of the research process, and therapeutic potential of *Match Emoji* among young adolescents.

Participants

Participants were recruited from one secondary school and two intermediate schools within the Wellington region of New Zealand. In New Zealand, secondary schools provide education to students who are approximately 13 to 19 years of age, whereas students attending intermediate schools are often aged between 11 to 13 (Ministry of Education, 2017). Due to the restrictions of COVID-19, recruitment processes varied across primary and intermediate schools. The

recruitment processes were negotiated with the principal or senior staff member at the corresponding school to ensure COVID-19 protocols were followed.

Recruitment at Secondary Schools

When recruiting participants in the secondary school, we could safely present the study requirements to over 400 years 9 and 10 students (aged between 13-15) as the Wellington region had no limit on the number of face-to-face gatherings. Students interested in taking part in the study and who had access to a smartphone or tablet were asked to complete an assent form. Following this, each participant took home a consent form for their parent or guardian to sign. Of the 42 participants who signed the assent form, 6 returned their consent form and participated in the study.

Recruitment followed a different process within the two intermediate schools as, during this time, COVID-19 restrictions in the Wellington region limited gatherings to no more than 100 people in any defined indoor or outdoor space. Therefore, in consultation with the principal at each intermediate school, recruiting students through individual classrooms was deemed more appropriate. A presentation about the project and what the research entailed was delivered to each classroom. Interested students were then asked to complete an assent form and take home a consent form for their parent or guardian to sign. From the 51 students across the two intermediate classrooms, 39 students signed the assent form and returned the completed consent form. Students who did not complete these forms were excluded from the study.

Intervention

Match Emoji is a match-three CVG that was designed to enhance psychological well-being. The primary aim of the game is to identify and match three or more similar coloured emojis together in rows or squares to earn points. The game uses six different coloured and shaped emojis, and each represents a unique digital expression such as an emotion or idea. The game has 99 different levels, with a player advancing to the next level on completion of the current level. Gameplay becomes increasingly more challenging as the player progresses. Completing a level requires matching a set number of emojis, whereupon a micro-message appears on the screen. Each micro message involves a short message such as "Take a break and notice what is around you!" or "just acknowledging you are feeling poop can actually really help" that is delivered via a dynamic messaging loading system. These micro-messages were informed by

the mental health literature, consultation with digital mental health experts and feedback from young adolescents. Images from the game can be viewed at matchemoji.org.nz.

Measures and Outcomes

Demographic data were collected at baseline. Students who reported more than one ethnicity were categorized using the New Zealand Census ethnicity prioritisation method (Poutasi, 2004).

The study's two primary outcome measures were (1) is *Match Emoji* acceptable among young adolescents and (2) is it easy to complete the study with young adolescents within a secondary school context. The acceptability among young adolescents was assessed through short semi-structured interviews with participants after the recommended regime of gameplay and game analytics, including the number of sessions and minutes played recorded via the Unity platform. The feasibility of the study was measured by the number of students interested in participating and adherence to playing the recommended regimen of *Match Emoji*.

The secondary outcomes measure completed at baseline and after completing the two weeks of recommended gameplay was efficacy. This was assessed by measuring changes of time from the Child and Adolescent Mindfulness Measure (CAMM), General Help-Seeking Questionnaire (GHSQ), Flourishing Scale (FS) and Revised Children's Anxiety and Depression Scale (RCADS).

Statistical Analysis

A general inductive approach (Thomas, 2006) was used to analyze the qualitative data obtained from the group discussions. The first author (RP) read participants' responses to immerse themselves in the data and clustered similar ideas together to formulate emerging themes. Another researcher reviewed the raw data s to ensure the themes accurately reflected the main ideas. Both researchers reported consistent themes among the data. The data was then coded using these themes, and salient quotes were selected.

Quantitative data from the four assessments were analysed using Microsoft Excel and R software. Pre-test and post-test summary statistics (mean, median, range and standard deviation) were computed using the R software developer package. Data was assessed for normality using the Shapiro-Wilk normality test. Since data was not normally distributed, the non-parametric Wilcoxon signed-rank test was used to compare the means between pairs of

values (pre and post). The test statistic and p-value were reported, and $p \leq 0.05$ were considered statistically significant.

Results

The 45 young adolescents who participated in the study had a mean age of 12.5 years (57% New Zealand European, 26% Māori, 60% Male) and were recruited from one secondary school and two intermediate schools in the Wellington region of New Zealand. All participants completed baseline and follow-up assessments.

Table 9

Demographics Of Participants

Demographics of Participants	
Sample size (n)	45
Age in years, mean (range)	12.5 (12-14)
Sex Male Female Non-binary	 60% 33% 6%
Ethnicity NZ/European Māori Pacific Asian	 57% 26% 9% 6%

<u>Acceptability</u>

In general, there was a high level of acceptability towards *Match Emoji* as most participants indicated that they would continue playing the game after completing the study (84%; 38/45). Some participants stated that they might continue to play *Match Emoji* (11%; 5/45), and a small number reported that they would not continue to play the game after the trial (4%; 2/45). In addition, 80% (36/45) reported playing *Match Emoji* after a 4-week follow-up, and 71% (32/45) were still playing after an 8-week follow-up.

Findings from the semi-structured interviews suggested that participants enjoyed playing *Match Emoji* for several reasons. First, participants enjoyed the accessibility of *Match Emoji*. For instance, many participants reported playing the game across multiple environments, including waiting rooms at the dentist, bus stops, and long car rides. As no internet connection

was needed, and most participants owned their phones, they could access the game whenever was most convenient:

"*I could play the game at church even when there was no Wi-Fi.*"
[Participant]

"*The game was really good when waiting for appointments cause it could distract me for a bit and didn't use up data.*"
[Participant]

Second, many participants reported enjoyment from playing the game. In general, participants mentioned this enjoyment stemmed from the captivating game features such as the increasing level of challenge, the variety of emojis, and clear goals. The simplicity of *Match Emoji* allowed some participants to start playing the game straight away without needing to learn the rules explicitly.

"*It was fun (be)cause the game got harder, but you knew what you had to do.*"
[Participant]

"*Super easy game to understand so you can just play is straight away without a rule book.*"
[Participant]

A smaller group of participants also provided suggestions about game features. This group appeared to be more frequent users of CVGs as they provided recommendations based upon other games they had played:

 "*You could add more rewards or more characters and then get more power-ups like Fortnite.*"
[Participant]

 "*Coins, customization, themed music, and bonus rounds…..add stuff like they have in other casual games.*"
[Participant]

Third, although some participants were sceptical about micro messages, there was a high level of consensus that they preferred micro-messages over typical in-game advertisements. In a

similar way, some participants stated that they noticed and preferred the messages more at the beginning of the game. In contrast, other participants mentioned they preferred the message at the end of the game when the level increased in challenge. Nevertheless, in general, participants liked the subtle aspect of accessing mental health content:

"*The messages were cringe at first but go way better.*"
[Participant]

"*Nice way of getting mental health information out there that isn't in your face*"
[Participant]

"*The messages were useful especially towards the end because it helped remind me to breath and notice stuff when I was stressed out.*"
[Participant]

"*I liked the breathing stuff to begin with…then I kinda just got just to them and didn't take much notice.*"
[Participant]

Feasibility

Despite our best efforts to recruit young adolescents from diverse cultural backgrounds, only two intermediates and one secondary school expressed interest in the study. These education providers were situated in high socioeconomic status areas, with most students identifying as New Zealand European. Although principals of intermediate and secondary schools located in lower socioeconomic status areas were interested in the research, many stated that the implications of the COVID-19 pandemic resulted in a change in the school's priorities.

The recruitment process outlined in the protocol was modified for the two intermediate schools. Changes involved recruiting participants from individual classrooms rather than through school assemblies. This was due to the government's COVID-19 restrictions on indoor gatherings.

Only three participants were unable to download *Match Emoji* onto their phones because their phones had limited capacity to download the necessary software. All participants in the study completed the four assessments (CAMM, GHSQ, FS, RCADS), with the time to complete these between 10-25 minutes. Several participants raised their hands during the assessments to seek

further understanding. Participants' questions were primarily centred on understanding some of the questions on the RCADS.

Game analytics, including the number of sessions and minutes played, were recorded anonymously through the Unity platform and confirmed the acceptability findings in the semi-structured interviews. On average, each participant played 7.5 sessions for 24 minutes across the two weeks, comprising a total of 180 minutes. Qualitative data recorded from the interviews suggested that participants completed approximately 50 out of the 99 available levels during the two-week duration of the study.

Efficacy

The secondary outcomes were assessed using the CAMM, GHSQ, FS and RCADS at baseline and after completing the two weeks of recommended gameplay. All 45 participants completed the question in each of the four assessments. In general, participants reported some therapeutic benefits across the assessments after the two-week follow-up, with a significant difference found on the RCADS (P=.049), as seen in Table 10.

Table 10

Secondary Outcomes At Baseline and Mean Changes After Two Weeks

Outcome	Mean at baseline (± sd)	Mean post game (± sd)	Mean of differences (95% CI)	Paired t test statistic	p-value*
CAMM	22.44 (±8.35)	23.82 (± 8.93)	1.38 (-0.03; 2.79)	1.9719	0.05492
GHSQ	62.89 (±21.96)	63.69 (±23.30)	0.8 (-2.71; 4.31)	0.45876	0.6487
FS	41.71 (±11.58)	40.62 (±12.07)	-1.09 (-2.83; 0.66)	-1.2579	0.2151
RCADS	46.24 (±26.39)	42.82 (± 26.49)	-3.42 (-6.84; -0.001)	-2.0161	0.04992

p-value*: p ≤ 0.05 is considered statistically significant

Table 11

Difference In Secondary Outcomes After Two Weeks.

Outcome	Baseline; N (%)			Post-game; N (%)		
	Mild	Moderate	Severe	Mild	Moderate	Severe
CAMM	45 (100%)	0	0	45 (100%)	0	0
GHSQ	24 (53.3%)	4 (8.9%)	17 (37.8%)	24 (53.3%)	2 (4.4%)	19 (42.2%)
FS	45 (100%)	0	0	45 (100%)	0	0
RCADS	33 (73.3%)	2 (4.4%)	10 (22.2%)	33 (73.3%)	3 (6.7%)	9 (20%)

Discussion

The results of this small study suggest *Match Emoji* is an acceptable method delivering mental health and well-being content among young adolescents. Adherence to the recommended regime of *Match Emoji* was high, with most participants playing longer than recommended. Most participants stated that they continued to play *Match Emoji* after a four and eight week follow up. In terms of feasibility, the implications of the COVID-19 pandemic created barriers to conducting research face-to-face. However, research methods were adapted to meet the restrictions on face-to-face gatherings. According to results from the CAMM, GHSQ, FS and RCADS, *Match Emoji* appeared to have some therapeutic effects, at least to some extent for participants.

Participants reported a high level of acceptability with *Match Emoji*, as evidenced by the game analytics, qualitative feedback and the large portion of participants who were still playing the game at four- and eight-weeks follow-ups. The percentage of participants who stated they continued to play *Match Emoji* even after a eight-week follow-up (71%) is contrary to the poor retention rate typically found across the range of digital interventions. Real-world data on user engagement with popular mental health apps suggests a small portion of users stay engaged with digital health interventions (Fleming et al., 2019). That is, approximately 4% of health app users continue to use the app after 15 days (Baumel et al., 2019).

Participants provided two salient reasons for the high level of acceptability with *Match Emoji*. First, participants commented on the accessibility to play *Match Emoji* for short periods across environments. Consistent with our previous work (Pine et al., 2020b) and research (e.g., Baumel et al. (, 2020), young adolescents tend to prefer more brief therapeutic encounters than what is typically expected from traditional mental health apps or technology. Given CVG mechanisms allow users to dip in and out of game-play sessions for short periods, they are an ideal platform to utilise. Second, delivering mental health and well-being content via a CVG was appealing due to the low demands on users to have access to Wi-Fi or specialized gaming skills. Large portions of the population can also receive the same content irrespective of their proficiency with gaming or access to the internet—addressing two significant barriers to engagement with DMHIs (Borghouts et al., 2021).

In terms of the micro-messages, most participants preferred these types of messages over typical in-game advertisements. While some participants commented on learning skills such as noticing in the semi-structured interview, there was little discussion about participants practising these skills outside of the game context. Nonetheless, research indicates that some young people report feelings of embarrassment and vulnerability when using an app for mental health purposes (Magee et al., 2018; Ribanszki et al., 2021). Hence, delivering subtle opportunities for users to access and customize different mental health and well-being options through an appealing CVG mechanism may be a non-stigmatizing way for adolescents to access focused content (Wies et al., 2021).

An important finding to consider for refining *Match Emoji* was changing how micro-messages were repeatedly delivered. Specifically, participants appeared to spend less attentional resources on the content of each micro-message as the game progressed. Thus, the more times the micro-messages appeared, the less salient each message became for some participants, a process called habituation (Kim & Wogalter, 2009). It is important to explore how micro-messages in *Match Emoji* can continue to captivate users' attentional demands as the game progresses.

Similarly, diverse preferences were found with gamification elements of *Match Emoji*. Some participants who appeared to be frequent CVG users were more concerned about the gamification elements than the content of micro-message. The various preferences towards micro-messages and game features among participants are consistent with the literature that suggest adolescents have different opinions towards the type of DMHI they are attracted to (Fleming et al., 2019). Thus, while some adolescents may be frequent CVG users and interested in gamification elements, others may be less focused on these features and more attracted to learning more about mental health and well-being.

The protocol and implementation of this study were completed during the enforced social distancing practices, which resulted in frequent changes to the restrictions on the size of inside gathers and the way educational facilities operated. There is in doubt these ongoing restrictions impacted the research processes. However, as Karmakar et al. (2020) suggest, research methods must be flexible in a crisis especially given the forever changing time constraints and restrictions. Therefore, to ensure research methods could be modified in a safe manner, we worked closely with the ethics committee and educational facilitates. For example, recruitment

procedures were adopted for the two intermediate schools to ensure the study could adhere to the limited restrictions on inside gatherings.

Apart from the implications of the pandemic, three participants in the study could not download *Match Emoji*. This was due to the smartphone's limited capacity to download the latest software. In addition, some participants struggled to understand several questions on the RCADS. These questions were discussed in more detail with each participant to ensure they understood the meaning of each one. Despite these challenges, no significant issues occurred with conducting the study in a primary and intermediate school context.

Lastly, results from the CAMM, GHSQ, FS and RCADS suggest *Match Emoji* may hold some preliminary therapeutic potential. Although this was not the primary focus of the trial and more rigorous work is required to explore the results, the findings are helpful for building on. Specifically, the RCADS and CAMM assessments share some similarities in assessing an individual's relationship with thoughts (Greco et al., 2011; Mathyssek et al., 2013). Given the promising trend in scores on both assessments, it is possible participants may have learnt skills related to accepting thoughts. Nevertheless, more rigorous research is needed to support this hypothesis and understand whether the micro-messages facilitated these learnings.

<u>Limitations</u>

There were several limitations to this research. First, as this was a small-scale trial that only required 45 participants, there were limited resources. Subsequently, the first author (RP) introduced the game to participants, led the recruitment process, supported the completion of assessments before and after playing the game and facilitated the discussions about the game. Although a research assistant and team members checked results for consistency, the led researcher was not blinded when facilitating discussions with the participants. The first author also played a significant role in developing the game, and they had an invested interest in the trial. Second, as few DMHIs test the acceptability and feasibility of their tool before conducting more formal trials, it is not possible to compare the results with other interventions. Comparing results from this trial with other trials was also more difficult as the methods required in the middle of a pandemic created a set of protocols that were unique to the specific context. Third, the self-assessment outcome measures relied on the subjectivity and honesty of the participant. While some participants raised their hand when they were unsure of a question, other participants may have merely guessed with some of the questions. The current findings should

be viewed as preliminary in light of these limitations. Fourth, it is difficult to fully separate and understand the therapeutic potential of the micro messages and the gameplay of *Match Emoji*. More specifically, it is possible that merely playing *Match Emoji* without attending to the micro-messages may lead to therapeutic effects. However, the current study was not able to examine these differences. Therefore, future research should test the therapeutic effects of each core component on its own.

Conclusion

Findings from this small-scale trial suggest that *Match Emoji* is an acceptable prototype for delivering mental health and well-being content among young adolescents in New Zealand. The results from the outcomes measures also suggest *Match Emoji* may promote therapeutic effects to some extent for young adolescents. More robust and rigorous research is required to explore and replicate these findings.

References

Baumel, A., Fleming, T., & Schueller, S. M. (2020). Digital Micro Interventions for Behavioral and Mental Health Gains: Core Components and Conceptualization of Digital Micro Intervention Care. *Journal of Medical Internet Research*, *22*(10). https://doi.org/10.2196/20631

Baumel, A., Muench, F., Edan, S., & Kane, J. M. (2019). Objective user engagement with mental health apps: Systematic search and panel-based usage analysis. *Journal of Medical Internet Research*, *21*(9). https://doi.org/10.2196/14567

Borghouts, J., Eikey, E., Mark, G., de Leon, C., Schueller, S. M., Schneider, M., Stadnick, N., Zheng, K., Mukamel, D., & Sorkin, D. H. (2021). Barriers to and Facilitators of User Engagement With Digital Mental Health Interventions: Systematic Review. *Journal of Medical Internet Research*, *23*(3). https://doi.org/10.2196/24387

Clark, T. C., le Grice, J., Moselen, E., Fleming, T., Crengle, S., Tiatia-Seath, J., & Lewycka, S. (2018). Health and wellbeing of Māori secondary school students in New Zealand: Trends between 2001, 2007 and 2012. *Australian and New Zealand Journal of Public Health*, *42*(6), 553–561. https://doi.org/10.1111/1753-6405.12839

Cleare, A., Pariante, C. M., Young, A. H., Anderson, I. M., Christmas, D., Cowen, P. J., Dickens, C., Ferrier, I. N., Geddes, J., Gilbody, S., Haddad, P. M., Katona, C., Lewis, G., Malizia, A., McAllister-Williams, R. H., Ramchandani, P., Scott, J., Taylor, D., & Uher, R. (2015). Evidence-based guidelines for treating depressive disorders with antidepressants: A revision of the 2008 British Association for Psychopharmacology guidelines. *Journal of Psychopharmacology (Oxford, England)*, *29*(5), 459–525. https://doi.org/10.1177/0269881115581093

Consumer Acquisition. (2020). *What are Casual Games in the Video Industry? | Consumer Acquisition*. https://www.consumeracquisition.com/faq/what-are-casual-games

Donkin, L., Christensen, H., Naismith, S. L., Neal, B., Hickie, I. B., & Glozier, N. (2011). A systematic review of the impact of adherence on the effectiveness of e-therapies. *Journal of Medical Internet Research*, *13*(3). https://doi.org/10.2196/JMIR.1772

Fairburn, C. G., & Patel, V. (2017). The impact of digital technology on psychological treatments and their dissemination. *Behaviour Research and Therapy*, *88*, 19. https://doi.org/10.1016/J.BRAT.2016.08.012

Fleming, T., Bavin, L., Lucassen, M., Stasiak, K., Hopkins, S., & Merry, S. (2018). *Beyond the trial: Systematic review of real-world uptake and engagement with digital self-help*

interventions for depression, low mood, or anxiety.
https://doi.org/10.26686/WGTN.12331259.V4

Fleming, T. M., de Beurs, D., Khazaal, Y., Gaggioli, A., Riva, G., Botella, C., Baños, R. M.,
Aschieri, F., Bavin, L. M., Kleiboer, A., Merry, S., Lau, H. M., & Riper, H. (2016).
Maximizing the impact of e-therapy and serious gaming: Time for a paradigm shift.
Frontiers in Psychiatry, *7*(APR). https://doi.org/10.3389/fpsyt.2016.00065

Fleming, T., Merry, S., Stasiak, K., Hopkins, S., Patolo, T., Ruru, S., Latu, M., Shepherd, M.,
Christie, G., & Goodyear-Smith, F. (2019). The importance of user segmentation for
designing digital therapy for adolescent mental health: Findings from scoping
processes. *JMIR Mental Health*, *6*(5). https://doi.org/10.2196/12656

Fusar-Poli, P., Correll, C. U., Arango, C., Berk, M., Patel, V., & Ioannidis, J. P. A. (2021).
Preventive psychiatry: a blueprint for improving the mental health of young people.
World Psychiatry : Official Journal of the World Psychiatric Association (WPA), *20*(2),
200–221. https://doi.org/10.1002/WPS.20869

Garrido, S., Millington, C., Cheers, D., Boydell, K., Schubert, E., Meade, T., & Nguyen, Q.
V. (2019). What Works and What Doesn't Work? A Systematic review of digital
mental health interventions for depression and anxiety in young people. *Frontiers in
Psychiatry*, *10*, 759. https://doi.org/10.3389/FPSYT.2019.00759/BIBTEX

Greco, L. A., Baer, R. A., & Smith, G. T. (2011). Assessing mindfulness in children and
adolescents: development and validation of the Child and Adolescent Mindfulness
Measure (CAMM). *Psychological Assessment*, *23*(3), 606–614.
https://doi.org/10.1037/A0022819

Brand, J., Jervis, J., Huggins, P., & Wilson, T., (2020). *Digital New Zealand* .
https://bond.edu.au

Karmakar, S., Dhar, R., & Jee, B. (2020). Covid-19: Research methods must be flexible in a
crisis. *BMJ*, *370*, 1847. https://doi.org/10.1136/BMJ.M2668

Kim, S., & Wogalter, M. S. (2009). Habituation, dishabituation, and recovery effects in visual
warnings. *Habituation, dishabituation, and recovery effects in visual warnings*.
https://doi.org/10.1518/107118109X12524444080675

Mathyssek, C. M., Olino, T. M., Hartman, C. A., Ormel, J., Verhulst, F. C., & van Oort, F. V.
A. (2013). Does the Revised Child Anxiety and Depression Scale (RCADS) measure
anxiety symptoms consistently across adolescence? The TRAILS study. *International
Journal of Methods in Psychiatric Research*, *22*(1), 27.
https://doi.org/10.1002/MPR.1380

Ministry of Education. (2017). *Pathways and transitions – Education in New Zealand*. https://www.education.govt.nz/communities-of-learning/transitions/

Mojtabai, R., Olfson, M., Sampson, N. A., Jin, R., Druss, B., Wang, P. S., Wells, K. B., Pincus, H. A., & Kessler, R. C. (2011). Barriers to mental health treatment: results from the National Comorbidity Survey Replication. *Psychological Medicine*, *41*(8), 1751–1761. https://doi.org/10.1017/S0033291710002291

Neufeld, S. A. S., Jones, P. B., & Goodyer, I. M. (2017). Child and adolescent mental health services: longitudinal data sheds light on current policy for psychological interventions in the community. *Journal of Public Mental Health*, *16*(3), 96–99. https://doi.org/10.1108/JPMH-03-2017-0013

Peiris-John, R., Farrant, B., Fleming, T., Bavin, L. , Archer, D., Crengle, S., & Clark, T. (2020). *Youth19 Rangatahi Smart Survey, Initial Findings: Access to Health Services*. www.youth19.ac.nz

Pine, R., Sutcliffe, K., McCallum, S., & Fleming, T. (2020). Young adolescents' interest in a mental health casual video game. *Digital Health*, *6*, 2055207620949391. https://doi.org/10.1177/2055207620949391

Poutasi, K. (2004). *Ethnicity data protocols for the health and disability sector. Wellington: Ministry of Health*. http://www.moh.govt.nz

Racine, N., McArthur, B. A., Cooke, J. E., Eirich, R., Zhu, J., & Madigan, S. (2021). Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19: A Meta-analysis. *JAMA Pediatrics*, *175*(11), 1142–1150. https://doi.org/10.1001/JAMAPEDIATRICS.2021.2482

Sheppard, R., Deane, F. P., & Ciarrochi, J. (2018). Unmet need for professional mental health care among adolescents with high psychological distress. *The Australian and New Zealand Journal of Psychiatry*, *52*(1), 59–67. https://doi.org/10.1177/0004867417707818

Skehan, B., & Davis, M. (2017). Aligning mental health treatments with the developmental stage and needs of late adolescents and young adults. *Child and Adolescent Psychiatric Clinics of North America*, *26*(2), 177–190. https://doi.org/10.1016/J.CHC.2016.12.003

Thomas, D. R. (2016). A general inductive approach for analyzing qualitative evaluation data. *27*(2), 237–246. https://doi.org/10.1177/1098214005283748

Torous, J., Nicholas, J., Larsen, M. E., Firth, J., & Christensen, H. (2018). Clinical review of user engagement with mental health smartphone apps: evidence, theory and

improvements. *Evidence-Based Mental Health*, *21*(3), 116–119.
https://doi.org/10.1136/EB-2018-102891

Chapter Nine: Discussion

In this research, I explored the potential of a new approach for supporting psychological well-being in young adolescents through two distinct phases. In Phase One, I explored the therapeutic potential and acceptability of casual video games (CVGs) to enhance psychological well-being by conducting a systematic literature review (Study One), focus groups and workshops with young adolescents (Study Two) and, an online survey with teachers and health professionals (Study Three). I then considered and synthesised findings from the literature, young adolescents, and the survey, which all suggested a CVG with mental health concepts was a promising idea. I then developed *Match Emoji*, a CVG for promoting psychological well-being in young adolescents. The development of the game comprised Chapter Seven. In Study Four, I tested *Match Emoji* in a pilot study. Findings from this pilot study suggested that a simple CVG mechanism and mental health messaging as used in *Match Emoji* represents a promising approach to support young adolescents' psychological well-being.

In the first part of this chapter, I summarise the four research questions that underpin the research. I then synthesise the results from the four studies and discuss their importance in the context of findings from previous research. In the third section, I examine the strengths and weaknesses of my overall research design and methodology. In the fourth section, I identify three distinct implications of the findings and provide a concluding statement to summarise the research.

Research questions

In Chapter Two, I demonstrated that young adolescents have high rates of psychological distress and low levels of well-being yet seldom receive the necessary support. Digital mental health approaches provide a promising way to reach young people; however, generally, engagement with these tools is far from ideal outside of trial settings. I hypothesised that a

promising approach for improving the uptake of digital mental health tools is through CVGs. As stated in Chapter Two, CVGs are ubiquitous. People play CVGs for many reasons, including restoring mood and becoming less bored. However, I found that research had not fully explored the therapeutic potential of this novel approach nor determined whether CVG mechanisms would be a suitable method for delivering focused mental health content to young adolescents. This was an apparent gap in the literature. It appeared that much of the previous research had endeavoured to use face-to-face processes in digital non-face-to-face contexts missing opportunities to exploit the affordances of new technology. Therefore, I systematically explored whether a CVG prototype adapted for mental health and well-being purposes could be an acceptable and feasible mechanism for delivering mental health and well-being content among young adolescents.

The four questions that underpinned these phases of my research were:
1. What are the effects of CVGs on anxiety, depression, stress, and low mood?
2. What are young adolescents' attitudes towards casual video games adapted for mental health and well-being purposes?
3. What are teachers' and health professionals' perspectives on adolescent mental health and digital mental health interventions?
4. What is the acceptability, feasibility of the research process and potential therapeutic capacity of a casual video game prototype (*Match Emoji*) for delivering mental health and well-being concepts among young adolescents?

As seen in Table 12, four stepwise studies were conducted to explore each of the four research questions. I also documented the unique methods of developing *Match Emoji* in Chapter Seven and completed a protocol paper on the pilot study of *Match Emoji* in Chapter Eight. Ultimately, this research led to three primary findings discussed below.

Table 12

The Contribution of Chapters Four, Five, Six, Seven and Eight in the Design, Development and Testing of Match Emoji.

		Chapter Four	Chapter Five	Chapter Six	Chapter Seven	Chapter Eight: Part One	Chapter Eight: Part Two	Contribution to the overall research question
Phase One	Finding One: Therapeutic Potential of CVGs	Systematic review (**Study One**)	Young adolescents' attitudes towards CVGs adapted for mental health and well-being purposes (**Study Two**)					CVGs appear to offer therapeutic potential
	Finding Two: Acceptability of CVGs and Prototypes		Young adolescents' attitudes towards CVGs adapted for mental health and well-being purposes (**Study Two**)	Teachers' and health professionals' perspectives on adolescent mental health and DMHIs (**Study Three**)				CVGs with mental health content appear to be an acceptable approach to young adolescents and educators
Phase Two	Finding Three: Acceptability of *Match Emoji*				Development of *Match Emoji*	Protocol for acceptability and feasibly study	Pilot study (**Study Four**)	*Match Emoji* appears to be an acceptable approach and shows potential, which should be explored.

Finding One: Therapeutic Potential of CVGs

Some studies have shown that CVGs may reduce mental distress in clinical populations (Fish et al., 2014; Russoniello et al., 2013, 2019) and restore mood in response to stress in non-clinical populations (Reinecke, 2009; Rupp et al., 2017). However, examining findings from single studies does not make it possible to form a transparent overview of the existing literature. Neither is it possible simply by reviewing previous research to explore whether CVGs offer new and largely untested therapeutic mechanisms of change.

In Study One, I synthesised the existing research on the effects of CVGs on anxiety, depression, stress, and low mood through a systematic review. Of the 13 studies that met the eligibility criteria of the systematic review, 12 reported improvements in their therapeutic outcome measures, with some studies reporting short term effects for reductions in anxiety and depressive symptoms immediately following a single session of CVG play (Fish et al., 2014; Russoniello et al., 2013, 2019). After synthesising the qualitative and quantitative data reported in the studies, I hypothesised that playing CVGs may inherently use therapeutic mechanisms proposed by flow theory to promote subtle mood-enhancing effects for some users (Nakamura & Csikszentmihalyi, 2009).

The quantitative-qualitative data triangulation from the findings in the focus groups, workshops, and open-text responses administered to young adolescents in Study Two strengthen these interpretations. In Study Two, many young adolescents reported playing CVGs for various reasons, such as relieving stress and promoting relaxation. One participant noted:

"*I have a folder for different types of CVGs on my phone….one group of games helps me when I am feeling stressed, another while I am bored and another to help distract myself*" *(Focus Group Participant)*

Reinecke (2009a;2009b) and Desai et al. (2021) suggest that many adults play video games for mood-enhancing reasons, including reducing stress and anxiety. Consistent with these qualitative findings, other studies have shown physiological and neural benefits in adults' brains when playing video games such as CVGs (Desai et al., 2021; Palaus et al.,2017). Although these findings are congruent with previous research involving adults (Desai et al., 2021), the current study is the first to consider the role of CVGs for young adolescents and how this type of game might have some therapeutic capacity for this population.

Taken together, findings from the systematic review and feedback from young adolescents suggest that CVGs may promote brief mood-enhancing effects or at least provide a release from unpleasant

experiences. The findings do not suggest CVGs are a complete solution on their own for reducing mental distress. Instead, it is more important to explore what opportunities CVGs afford to support young adolescents' mental well-being.

Finding Two: Acceptability of CVG Prototypes

Researchers such as Whitbourne et al. (2013) and Chesham et al. (2017) have demonstrated that CVGs are highly popular among adults. More specifically, the recent State of Online Gaming Report (2021) published in the United States of America suggests that approximately 87% of adults play CVG 'occasionally', defined as once a week or more often. However, there has been a lack of research focused on understanding whether CVGs have the same appeal for younger populations. Therefore, although CVGs may provide promising therapeutic opportunities, seldom have CVGs been explored as either a standalone therapeutic mechanism or a method to exploit for delivering mental health and well-being content among younger populations.

To estimate the acceptability of CVGs and the concept of CVGs adapted for young adolescents' mental health and well-being, I used focus groups, workshops, and open text forms with 207 young adolescents in the Wellington region. Consistent with studies among adult populations (Chesham et al., 2017; Whitbourne et al., 2013), I found that 91% (188 out of 207) of the participants in Study Two reported playing CVGs one or more times a week. Most young adolescents reported enjoyment and high satisfaction from playing these games irrespective of ethnicity, gender and game genre. Participants' comments indicated that the appeal of CVGs might be due to the limited duration and the accessibility of these games. This is consistent with advantages highlighted in other research; specifically, CVGs can be played across environments, enjoyed in brief sessions that easily fit into participants' schedules, even when time is limited (Shafer & Carbonara, 2015).

Similar to findings in recent studies (e.g. Baumel et al., 2020), participants in Study Two seemed to enjoy the ephemeral nature of playing CVGs. For example, one participant in the focus groups stated, "*I only use apps and games on my smartphone for a few minutes at a time, so a quick mental health type game is good*". As stated previously, some CCBT programmes and mental health apps often require users to engage in sessions lasting at least 30-minutes over a 10 to 12-week period. However, users of DMHIs may not be accustomed to engaging in digital programmes for such a prolonged duration and over such an extended amount of time (Egglestone et al.,2016). In contrast to the time required to engage in digital approaches such as CCBT interventions, CVGs offer untapped opportunities to deliver small increments of mental health and well-being content via an existing and popular mechanism.

Given the broad appeal of CVGs and potential therapeutic processes already involved, I adapted prototypes of CVGs to deliver mental health messages with feedback from young adolescents. Adding mental health concepts to adolescents' existing technology preferences appeared promising, with most participants optimistic about this novel approach. In general, most participants recognised that mental health was an important issue and provided key recommendations about the prototypes, such as adopting an engaging interface and subtle mental health content.

In Study Three, I explored teachers' and health professionals' perspectives on adolescent mental health and digital mental health interventions through an anonymous online survey. This study was important because teachers and health professionals play an essential role in supporting young adolescents' well-being (Goodyear & Armour, 2021) and in implementing and disseminating new technologies (Schuster et al., 2018). Even though the COVID-19 pandemic limited the feasibility of exploring stakeholders' perspectives face-to-face, the findings from the survey suggested that teachers and health professionals are open to recommending digital mental health interventions to young people. Most teachers and health professionals were optimistic about DMHIs. However, participants in the study also emphasised the need to use a combination of approaches that include both digital and face-to-face supports.

In general and consistent with the literature, teachers and health professionals in the study suggested that currently, mental health approaches appear to be insufficient to meet adolescents' growing mental health needs (Studwick et al., 2020; Rudd & Beidas, 2020; Benning et al., 2021). Digital approaches are not a one-size-fits-all solution for addressing this challenge. However, they do offer promising and highly acceptable opportunities to increase access to mental health support, especially for those underserved and hard to reach populations. Furthermore, while I did not directly explore the CVG prototypes with teachers and health professionals, the results helped reinforce the general acceptability of developing real-world solutions such as CVGs adapted for mental health and well-being purposes for supporting young people's mental health.

Finding Three: Acceptability of *Match Emoji*

Recent research suggests user engagement with a digital health intervention is four times higher in trial settings compared with the same intervention in real-world settings (Wind et al., 2020). It has also been estimated that 4% of users continue using behavioural and health apps after 15 days (Patel et al., 2007). In the face of this poor engagement, I have shown that a widely engaging approach, CVGs, offer potential as an acceptable approach for delivering mental health and well-being content among young adolescents in the intended real-world context.

As evidenced in Study Four, most young adolescents reported high levels of acceptability for *Match Emoji*. Participants commented on the captivating game features and the ease with which they could play *Match Emoji* for short periods, even without an internet connection. Game analytics corroborated these findings with participants playing more frequently and for longer sessions than asked. Most importantly, game analytics and follow-ups showed that 80% (36/45) of participants were still playing *Match Emoji* after four weeks, and 71% (32/45) were still playing after eight weeks. Despite the small-scale trial (n=45) with limited follow-up in Study Four, results are extremely promising given the challenges constantly reported in the research (Patel et al., 2007, Torous et al., 2020; Baumel et al., 2019).

Strengths and Limitations

In this research, I explored an innovative idea based upon my observations working as an educational psychologist with young adolescents in New Zealand. I developed a step-wise series of studies that fully explored the potential of CVGs as both a standalone therapeutic mechanism and as an engaging method for delivering mental health and well-being content. While this was a novel idea based mainly on observations, new solutions need to be developed and tested to address the growing mental health needs among young adolescents.

The first principal strength of the research was using a mixed-methods approach to understand, explore, and integrate the research findings from diverse methods. Adopting more than one particular approach enabled richer and more complete data to be obtained and helped confirm the research results (Tashakkori & Creswell, 2008). For example, in Study One, I reviewed the literature concerning the effects of CVGs on anxiety, depression, stress and low mood. I found that 12 out of the 13 studies had reported promising results for reducing mental distress among adults. These promising findings were strengthened in Study Two, where young adolescents reported playing CVGs for serval reasons such as relieving stress and feeling relaxed. The different research methods used across these studies with diverse populations provided a more comprehensive understanding of the potential role of CVGs. However, although this approach was useful, a single and more in-depth approach may have also been beneficial, especially given that specific methods may have been underdeveloped, such as the survey and pilot study. Nevertheless, the mixed-methods approach was deemed appropriate for scoping out a novel idea.

Second, the core research questions related to the potential of CVGs were thoroughly explored in a step-wise process. In this way, each study built on the learning from the previous ones to explore a novel and complex idea. Moreover, research was collected across environments from multiple stakeholders. The ecological nature of this research helped strengthen findings and develop a more

complete understanding of the context surrounding young adolescents in New Zealand. Third, each research question was explored in real-world settings rather than in tightly controlled research conditions (Holleman et al., 2020). Thus, the findings of each study contributed to meaningful and relevant implications for the research context. Fourth, I cultivated an active and collaborative approach with all stakeholders, including the young adolescents, the App developers, digital mental health experts, psychologists, and advisors. This process supported the development of key relationships, helped test ideas quickly with target users and facilitated the recruitment process with local intermediate and secondary schools. These relationships also helped close the gap between research production and research use, a common challenge for health researchers (Boaz et al., 2018). For example, teachers promoted *Match Emoji,* and the research findings were disseminated among target users and stakeholders on follow-ups

There are key limitations to this research. First, I led the four studies on *Match Emoji*, many of which involved obtaining a range of feedback from young adolescents about the ideas and design features of the game. This risks investigator bias, especially when formulating themes from the raw data (Galdas (2017). I tried to reduce and minimize the possibility of investigator bias by asking my supervisors and research assistance to check the themes for consistency. I also checked the raw data with participants to ensure I accurately captured their perspectives. However, as Galdas (2017) suggests, research bias is challenging to mitigate when leading the project and remains a significant limitation. Furthermore, the participants in Study Two, Three and Four were likely aware that I was interested in the topic and had contributed to the design and development of *Match Emoji*. To this extent, the research findings need to be considered in the context of social desirability biases.

Second, studies throughout the thesis are small in nature and involve specific populations. For instance, in total, Study Two and Study Four comprised 252 young adolescents aged 13 to 15 in the Wellington region of New Zealand. Accordingly, the generalisability of findings across other populations (such as older adolescents) and other areas is limited. This is a common limitation in many trials investigating digital mental health tools (Mohr et al., 2017). Notably, mental health needs and preferences vary across individuals. Hence, while some young adolescents who are generally experiencing a 'good' level of psychological well-being may be interested in specific elements of *Match Emoji*, such as the gamified emojis, other individuals may need more intensive support. Therefore, it is not easy to extrapolate the results to other populations with higher unmet mental health needs.

Third, the pilot study of *Match Emoji* was completed over a short duration, provided limited follow-up, had a small sample size and was not randomised. There was also some ambiguity expressed by

the participants over some of the questions in the assessments. As stated in Chapter Two, there is also a lack of consensus in the literature on what assessments accurately capture psychological well-being constructs. Consequently, while the preliminary data indicates that *Match Emoji* appears acceptable to young adolescents and the study process was feasible despite conducting research during the COVID-19 pandemic, results from the therapeutic outcome measures must be considered along with these limitations. Nevertheless, while a more robust and more extensive trial is needed, this pilot study provides a strong rationale for exploring *Match Emoji* and other CVG approaches in future studies.

Fourth, although several published studies were included in this thesis, the depth of each study was comprised at times. For example, in Study Six, questions were not piloted and important information, including the participants' demographics, was not recorded. These omissions can affect the rigour of the research process and limit the potential for results to be generalised. In future research, it is important to explore each research question in-depth, taking into consideration the time needed for planning and the completion of the study.

In summary, the research methods adopted across this research programme were appropriate for developing and testing a single prototype. However, this approach is only one possible direction that was used to test a new idea. Instead, other researchers may use a combination of different methods or rely on one more in-depth method to explore the potential of real-world solutions for mental health and well-being. Nevertheless, the results of *Match Emoji* should be considered of interest to developing the literature concerning the development and testing of a new approach in digital mental health.

Implications and Future Research

Explore the Affordances of Casual Video Games

This research highlights the importance of responding to the mental health needs of young people by exploring the affordances of CVGs. Seldom have CVGs been exploited to enhance mental health and well-being, let alone been explored as an engaging mechanism to deliver specialised content to target users. While the current research findings do not suggest CVGs or CVGs adapted with mental health and well-being content are a one-size-fits-all approach or a solution to reducing mental distress, the implications for exploring the affordance of these games are twofold.

First, the research findings suggest CVGs are a promising standalone therapeutic mechanism that might offer users a release from unpleasant experiences and promote subtle mood-enhancing effects. As evidenced by results from Study One, 12 out of the 13 studies in the systematic review reported

promising therapeutic effects of CVGs on reducing anxiety, depression, stress and low mood. These results were supported in Study Two, where many young adolescents reported playing CVGs to relieve stress and feel more relaxed. The combination of findings can encourage researchers and health practitioners to harness the therapeutic processes afforded by CVGs for supporting the mental health of young people and broader populations. More specifically, CVGs could be included in the existing suite of mental health approaches or integrated into a broader ecosystem of brief digital mental health interventions

Second, CVGs adapted for mental health, and well-being purposes offer a promising and potentially acceptable mechanism for delivering mental health and well-being content to young people from diverse backgrounds. This is important because many barriers to seeking mental health exist, including cost, stigma, and geographical isolation. The concept of a CVG adapted to deliver mental health and well-being content is novel and was a generally accepted approach among young people, health professionals and teachers in my studies. Through this mechanism, researchers and health professionals may be able to provide accessible, controlled and highly focused mental health content in a user-centred way to under-served populations. Furthermore, although this research focused on mental health and well-being content, other health-related content could be delivered through such a mechanism. For example, given the popularity of CVGs among older populations, relevant and highly focused motivational content could promote positive behaviour change related to individuals' physical exercise patterns.

Exploit-Target Users' Current Technology Strategies

One of the aims of this research was to explore and endeavour to build upon young peoples' current pattern of behaviours toward technology for mental health purposes. From results from the focus groups, workshops, and open-text forms with 207 young adolescents in Study Two, CVGs appeared to be an unmoderated and implicit approach to supporting mental health and well-being among young people. Considering many young adolescents and adults use CVGs for implicit well-being purposes, I developed a 'bottom up' approach that focused on using young adolescents' current technology strategies.

This bottom-up approach towards developing a DMHI is important because inevitably, as the capabilities of technologies continue to evolve rapidly, so will target users' technology strategies. For instance, while computers were once the dominant method for accessing the internet, they quickly became obsolete after the development of smartphones and laptops (Mohr et al., 2018). In a similar way, preferences toward smartphones and CVGs may be less pronounced due to advances in technology capabilities. However, despite changes in preferences and technology strategies, this

user-centred approach to developing a digital mental health game provides a novel approach that leverages how young adolescents currently use technology. In this way, the programme of research provides a blueprint for developing future user-centred digital mental health tools. Subsequently, researchers and App developers can acknowledge and exploit end-user's current technology engagement methods in similar ways that CVGs were used to deliver mental health and well-being content. By building on target users' implicit technology strategies, it is possible to avoid validating digital health interventions that rely on obsolete technologies and, thus, were unlikely to be used anyway.

Match Emoji

Although Match Emoji is currently available on the Google Play and Apple App Store, several components of the game can be enhanced with funding. These improvements include but are not limited to more culturally responsive avatars, push notifications and refining the micro-messages. However, consistent with the literature on the sustainability of DMHIs (e.g. Mohr et al., 2017; Marshall et al., 2020), there is a cost associated with these aspirations for the game. For example, keeping Match Emoji on the Google Play and Apple App Store costs. In addition, enhancing the game features and using the learning from the pilot study, such as including broader psychological assessments to test the game's effectiveness in more rigorous trial conditions, requires financial support. Therefore, while Match Emoji has shown promising therapeutic effects and acceptability in the pilot study, without funding, there is a high risk that it may not be developed in the future.

Conclusion

To the best of my knowledge, this project represents the first systematic programme of research aimed at exploring the use of CVGs as a mechanism for enhancing psychological well-being among young people. Digital tools often translate therapeutic content to a digital interface without deeply exploring how people use digital tools or their pre-existing technology strategies regarding mental health and well-being. Simply translating these face-to-face processes fails to exploit new opportunities afforded by technology. I have identified a new approach for supporting psychological well-being outcomes using CVG processes in a way that has not previously been reported in the literature. From the four studies I conducted, I have shown that adding mental health and well-being content to widely-played and popular CVGs is a promising idea. Based upon findings from the systematic review of the literature on CVGs, and feedback from young people, teachers and health professionals, I developed a prototype version of a CVG, *Match Emoji*. *Match Emoji* was then tested in a pilot study and showed high levels of acceptability among participants during and after the completion of the study. Future research should explore the opportunities afforded by this programme of research and by CVGs more generally. More broadly, developers, game designers and digital mental health researchers may build on new opportunities for therapeutic change that

may lead to higher levels of engagement in real-world settings. Thus, while CVGs may currently be a popular game among young adolescents, other 'types' of games may be as popular, if not more so, in the future and be poised to be built upon for therapeutic change. Policymakers can take notice of the acceptability, low-cost and promising potential of pre-existing strategies for mental health purposes, especially in a complex turbulent environment where resources are scarce. A CVG adapted for mental health and well-being purposes is a promising approach for delivering a light level of mental health content for young adolescents. This research is timely given the need to prioritise the mental health and well-being of young adolescents and the need to explore new opportunities in digital mental health.

Appendices

Appendix A: Participation Information Sheet and Consent Forms (Trial)

Match Emoji: A Casual Video Game with Psychological Wellbeing Concepts.

Lead Researcher: Russell Pine

Study Site: Secondary School

Contact phone number███████████.

Ethics committee ref.: 21/NTA/34

You are invited to take part in a study to understand if a casual video game (*Match Emoji*) that has been created with year 9 and 10 students and professionals is an appealing game and can support youth wellbeing. Whether or not you take part is your choice. If you don't want to take part, you don't have to give a reason. If you do want to take part now, but change your mind later, you can pull out of the study at any time.

This Participant Information Sheet will help you decide if you'd like to take part. It sets out why we are doing the study, what your participation would involve, what the benefits and risks to you might be, and what would happen after the study ends. We will go through this information with you and answer any questions you may have. You do not have to decide today whether or not you will participate in this study. Before you decide you may want to talk about the study with other people, such as family, whānau, friends, or healthcare providers. Feel free to do this.

If you agree to take part in this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

This document is 8 pages long, including the Consent Form. Please make sure you have read and understood all the pages.

VOLUNTARY PARTICIPATION AND WITHDRAWAL FROM THIS STUDY

Participation in this study is voluntary. If you don't want to take part, you don't have to give a reason. If you do want to take part, you are free to withdraw from the research at any time, without experiencing any disadvantage.

IS THE PURPOSE OF THE STUDY AND WHAT IS *MATCH EMOJI*?

The purpose of the study is to understand if a casual video game (*Match Emoji*) that has been created with year 9 and 10 students and professionals is an appealing game and can support youth wellbeing.

Match Emoji is a match-three casual video game. The aim of *Match Emoji* is to match three of the same coloured emojis together to earn points and progress through the game. While playing the game, 'micro-messages' related to psychological wellbeing pop up instead of adds. For example, "Noticing can be like your superpower to help you get unstuck!" and "Phew! Take a small breath to help reset and try again". Below are screen shots from the game.

WHO CAN TAKE PART IN THE STUDY?

You have been invited to participate because you are a year 9 or 10 student. If you decide to take part in the study, we will ask you to play *Match Emoji* 3-4 times a week for 5-15 minutes over a 2-week period.

WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?

Four Questionnaires The purpose of the four questionnaires is to understand different areas of your wellbeing before and after playing *Match Emoji*. The questionnaires involve questions that are related to how you mange thoughts and emotions, how likely you are to seek help if you are feeling down, how you see yourself in different areas of life and understand any possible emotional difficulties. If questions are sensitive or cause embarrassment, you can choose not to answer them, and you will not be disadvantaged. Please remember, the completion of the questionnaires **will not** result in a medical diagnosis and **will not** result in treatment. The four assessment will take between 10-20 minutes to complete all together.

Short Interview After playing the game, you will be invited to take part in an interview at a familiar and safe place within your school such as your form class. This interview will take no longer than 30 minutes. Questions will involve: What parts of the game did you like? What parts of the game could be improved? What did you learn from playing the game? Did you try and use any of the ideas from the game and if so, which ones? Do you think you will continue to play *Match Emoji*? At the end of the interview, you will be able to read and correct answers.

WHAT ARE THE POSSIBLE RISKS OF THIS STUDY?

It may be necessary for the Lead Researcher to share your information with other people such as your school counsellor or a trusted adult – for example, if the results from the questionnaires give an unexpected result that could be important for your health. This allows appropriate follow-up to be arranged.

WHAT ARE THE POSSIBLE BENEFITS OF THIS STUDY?

Information from the study will help improve the overall look and feel of *Match Emoji*. We are interested to improve the game and your feedback will help with this. Results will also support possible publications and future outputs such as presentations. **E REIMBURSED?**

You will not incur any costs. *Match Emoji* is free to download and play.

WHAT WILL HAPPEN TO MY INFORMATION?

During this study, the research team will record information about you and your study participation. This includes the results of four questionnaires and game analytics. You cannot take part in this study if you do not consent to the collection of this information.

Identifiable Information

Identifiable information is any data that could identify you (e.g., your name and date of birth. Only the research team will have access to your identifiable information.

It may be necessary for the Lead Researcher to share your information with other people such as your school counsellor or trusted adult – for example, if the results from the questionnaires give an unexpected result that could be important for your health. This allows appropriate follow-up to be arranged.

De-identified (Coded) Information

To make sure your personal information is kept confidential, information that identifies you will not be included in any report generated by the research team. Instead, you will be identified by a code. The research team will keep a list linking your code with your name, so that you can be identified by your coded data if needed.

Only the research team will have access to your coded information.

The results of the study may be published or presented, but not in a form that would reasonably be expected to identify you.

Future Research Using Your Information.

If you agree, your coded information may be used for future research related to *Match Emoji*.

You will get plain English summaries about the overall study results, if requested four weeks after completion of the study.

Your information may be used indefinitely for future research unless you withdraw your consent. However, it may be extremely difficult or impossible to access your information or withdraw consent for its use once your information has been shared for future research.

Security and Storage of Your Information.

Your identifiable information is held at Victoria University of Wellington in a secure locked storage folder during the study. After the study it will be stored for at least 10 years, then destroyed.

All storage will comply with local and data security guidelines. The linked data in this study will be destroyed after 10 years.

Risks.

Although efforts will be made to protect your privacy, absolute confidentiality of your information cannot be guaranteed. Even with coded and anonymised information, there is no guarantee that you cannot be identified. This is particularly important to consider as confidentiality may be more difficult to protect when presenting information at school and conducting interviews.

Data-linking can produce a detailed picture of individuals. Data-linking increases the risk of identifying individuals and possibly others who may be in the same households, organisations, iwi or hapū. Some of the data sets being linked may have been designed, and some data may have been collected, without the intention of them being used with other data sets. Some data sets may have been collected in ways which have resulted in biases, meaning that there is the potential for inappropriate inferences to be drawn. These things have the potential to cause harm. While we have taken steps to minimise their likelihood, we cannot guarantee they will not occur.

<u>Rights to Access Your Information.</u>

You have the right to request access to your information held by the research team. You also have the right to request that any information you disagree with is corrected. This includes the opportunity for participants to read and correct answers from the interviews.

Please ask if you would like to access the results of your assessments during the study.

If you have any questions about the collection and use of information about you, you should ask the Lead Researcher Russell Pine.

<u>Data-Linking.</u>

In this study we will be linking your study information with other data sets which include information about you. This is called 'data-linking'. Data-linking in this study is mandatory.

In this study we will link your name, date of birth, sex, ethnicity, information from the four questionnaires and game analytics together. Game analytics include the amount of time you played the game for and how many sessions you played.

<u>Use of New Technologies:</u>

Playing *Match Emoji* is a mandatory component of study participation. Identifiable information recorded from the study includes the following: name, date of birth, sex, and ethnicity.

Analytics including the minutes and sessions played will be stored on the Unity platform. Only the research team will be able to link the minutes and sessions played from the game to the data from the four questionnaires.

The Unity platform which stores game play data does not share information with any third parties and does no ask for permission to access unrelated information that may be used for advertising or other commercial purposes. The Unity platform safeguards information with encryption mechanisms. This will ensure the game play statistics are only accessible to the research team.

WHAT HAPPENS AFTER THE STUDY OR IF I CHANGE MY MIND?

You may withdraw your consent for the collection and use of your information at any time, by informing the lead investigator Russell Pine on 02040864377 or <u>Russell.pine@vuw.ac.nz</u>

If you withdraw your consent, your study participation will end, and the study team will stop collecting information from you.

Information collected up until your withdrawal from the study will continue to be used and included in the study. This is to protect the quality of the study.

If you wish, you can continue to play *Match Emoji* on your digital device after the competition of the study. Data will **not be** recorded after the completion of the study.

CAN I FIND OUT THE RESULTS OF THE STUDY?

Participants will be provided with a plain English summary of the study results, if requested   four weeks after completion of the study.

WHO IS FUNDING THE STUDY?

The Health Research Council funded the development of *Match Emoji* and Cure Kids funded the development of the current acceptability and feasibility study.

This study has been approved by an independent group of people called a Health and Disability Ethics Committee (HDEC), who check that studies meet established ethical standards. The Northern A Health and Disability Ethics Committee has approved this study.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns or complaints about the study at any stage, you can contact:
Russell Pine, PhD student

If you want to talk to someone who isn't involved with the study, you can contact an independent health and disability advocate on:

Phone: 0800 555 050
Fax: 0800 2 SUPPORT (0800 2787 7678)
Email: advocacy@advocacy.org.nz
Website: https://www.advocacy.org.nz/

You can also contact the health and disability ethics committee (HDEC) that approved this study on:
Phone: 0800 4 ETHIC
Email: hdecs@health.govt.nz

Match Emoji: A Casual Video Game with Mental Wellbeing Concepts

Please tick to indicate you consent to the following.

I have read or have had read to me in my first language, and I understand the Participant Information Sheet.	
I have been given sufficient time to consider whether or not to participate in this study.	
I have had the opportunity to use a legal representative, whānau / family support or a friend to help me ask questions and understand the study.	
I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet.	
I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without this affecting my current support.	
I consent to the research staff collecting and linking information, including information about my health and game play.	
If I decide to withdraw from the study, I agree that the information collected about me up to the point when I withdraw may continue to be processed.	Yes ☐ No ☐

I consent to my school counsellor or trusted adult being informed of my assessment results if they give an unexpected result that could be important to my health	Yes ☐	No ☐

I agree to an approved auditor appointed by the New Zealand Health and Disability Ethics Committees, or any relevant regulatory authority or their approved representative reviewing my relevant medical records for the sole purpose of checking the accuracy of the information recorded for the study.

I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.

I understand the compensation provisions in case of injury during the study.

I know who to contact if I have any questions about the study in general.

I understand my responsibilities as a study participant.

I wish to receive a summary of the results from the study.	Yes ☐	No ☐

Declaration by participant:

I hereby consent to take part in this study.

Participant's name:

Signature: Date:

Declaration by member of research team:

I have given a verbal explanation of the research project to the participant and have answered the participant's questions about it.

I believe that the participant understands the study and has given informed consent to participate.

Researcher's name:

Signature: Date:

If the study causes you to become upset, please talk to an adult you can trust, a counsellor, or call Youth line on 0800 376 633, text them on 234, or check out

[www.youthline.co.nz.](http://www.youthline.co.nz) You can also contact What's Up on 0800 942 8787

Appendix B: Ethics Approvals for Trial

Health and Disability Ethics Committees

Ministry of Health
133 Molesworth Street
PO Box 5013
Wellington
6011hdecs@health.govt.nz

28 May 2021

Mr Russell Pine
Kelburn, Wellington 6012
Wellington 6011

Dear Mr Pine

Re:	**Ethics ref:**	**21/NTA/34**
	Study title:	The Feasibility and Acceptability of a Casual Video Game with Mental Wellbeing Concepts Among Year 9 and 10 Students.

I am pleased to advise that this application has been _approved_ by the Northern A Healthand Disability Ethics Committee with conditions. This decision was made through the HDEC-Full Review pathway.

Conditions of HDEC approval

HDEC approval for this study is subject to the following conditions being met prior to thecommencement of the study in New Zealand. It is your responsibility, and that of the study's sponsor, to ensure that these conditions are met. No further review by the Northern A Health and Disability Ethics Committee is required.

Standard conditions:

1. Before the study commences at _any_ locality in New Zealand, all relevantregulatory approvals must be obtained.

2. Before the study commences at _each given_ locality in New Zealand, it must beauthorised by that locality in Online Forms. Locality authorisation confirms thatthe locality is suitable for the safe and effective conduct of the study, and that local research governance issues have been addressed.

Non-standard conditions:

*   Please amend section 8.5 of the data management plan to reflect that there willbe future use of the data if the results of the feasibility study indicate it is worthwhile continuing to study Emoji Match. This future use of data is not optional.

Non-standard conditions must be completed before commencing your study, however,they do not need to be submitted to or reviewed by HDEC.

If you would like an acknowledgement of completion of your non-standard conditions youmay submit a post approval form amendment through Online Forms. Please clearly identify in the amendment form that the changes relate to non-standard conditions.

For information on non-standard conditions please see section 125 and 126 of the *Standard Operating Procedures for Health and Disability Ethics Committees* (available on www.ethics.health.govt.nz)

After HDEC review

Please refer to the *Standard Operating Procedures for Health and Disability Ethics Committees* (available on www.ethics.health.govt.nz) for HDEC requirements relating to amendments and other post-approval processes.

Your next progress report is due by 27 May 2022.

Participant access to ACC

The Northern A Health and Disability Ethics Committee is satisfied that your study is not a clinical trial that is to be conducted principally for the benefit of the manufacturer or distributor of the medicine or item being trialled. Participants injured as a result of treatment received as part of your study may therefore be eligible for publicly-funded compensation through the Accident Compensation Corporation (ACC).

Please don't hesitate to contact the HDEC secretariat for further information. We wish you all the best for your study.

Yours sincerely,

Mrs Kate
O'Connor Acting
Chairperson
Northern A Health and Disability Ethics Committee

Encl: appendix A: documents submitted
        appendix B: statement of compliance and list of members

Document	Version	Date
Protocol: This document outlines the protocol for *Match Emoji*.	Word Document	23 February 2021
CV for CI: CV for Russell Pine	Word Document	23 February 2021
Evidence of scientific review: Aims to articualte the work we have previously completed to inform the design of the game and if the idea was worth further invetigation	Word Document	03 August 2020
Evidence of scientific review: Input from teachers and health professionals into the game.	Word Document	01 September 2020
Evidence of scientific review: Inital systematic review of casual video games.	Word Document	03 February 2020
PIS/CF: Information sheet and ascent form for particiapants	Word Document	23 February 2021
PIS/CF for persons interested in welfare of non-consenting participant: Information sheet and consent for principals	Word Document	23 February 2021
PIS/CF for persons interested in welfare of non-consenting participant: Information sheet and consent form for parent or guardian.	Word Document	23 February 2021
Successful Cure Kids Grant	Email	10 December 2020
HRC Application	Word Document	03 August 2020
Application		25 February 2021
Survey/questionnaire		
Survey/questionnaire		
Survey/questionnaire		
Survey/questionnaire		
Survey/questionnaire		
Other (No Description Entered)		
Other (No Description Entered)		
Other (No Description Entered)		
Other (No Description Entered)		
Other (No Description Entered)		
Other (No Description Entered)		
Other (No Description Entered)		
Independent Peer Review	1.0	10 May 2021
Covering Letter: Comments that have been addressed.	1.0	10 May 2021
Version 2.0 of the Data Management Plan.	2.0	29 April 2021
Protocol: Version 2.0 of the Protocol.	2.0	29 April 2021
Information Sheet and Assent form	2.0	29 April 2021
PowerPoint for Students. Response to Committee.	1.0	29 April 2021
CVs for other Investigators: CV for Dr Terry Fleming. Response to Committee.	1.0	29 April 2021
Response to Request for Further Information		
(None)		
(None)		
(None)		

Appendix C: Ethics Approvals for Survey

Dear Head of School or delegate,

A Human Ethics application has been approved for a researcher in your School. The application details are below. You have online access to this form through ResearchMaster here: https://rme6.vuw.ac.nz/RME6/.

Application ID: 0000027998
Application title: Teachers', parents' and health practitioners' attitudes on mental health and digital interventions.
Researcher: Russell Pine

It is best to use either Internet Explorer or Safari to access the system.

Thank you

ResearchMaster

*****This is an automated email. Do not reply to this email address*******
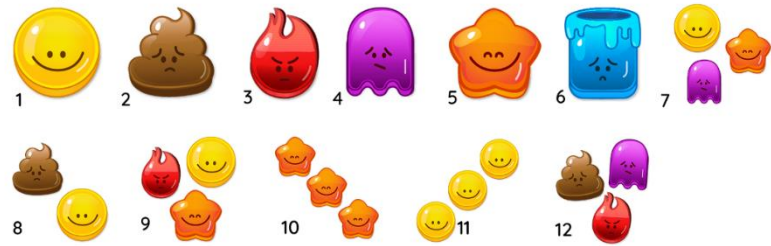
Queries for the central Human Ethics Committee can be sent to ethicsadmin@vuw.ac.nz
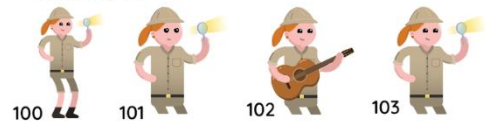Pipitea Ethics subcommittee queries can be sent to: pipitea-hec@vuw.ac.nz
Psychology Ethics subcommittee queries can be sent to: louise.hamblin@vuw.ac.nz
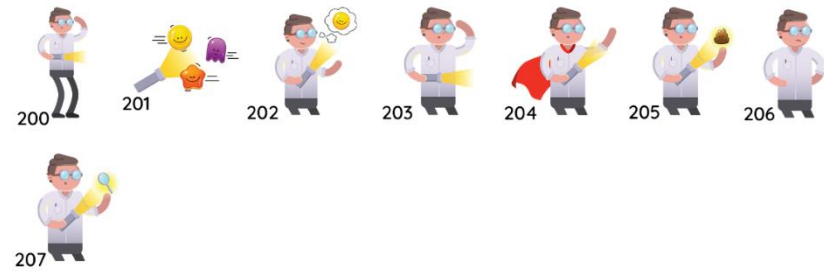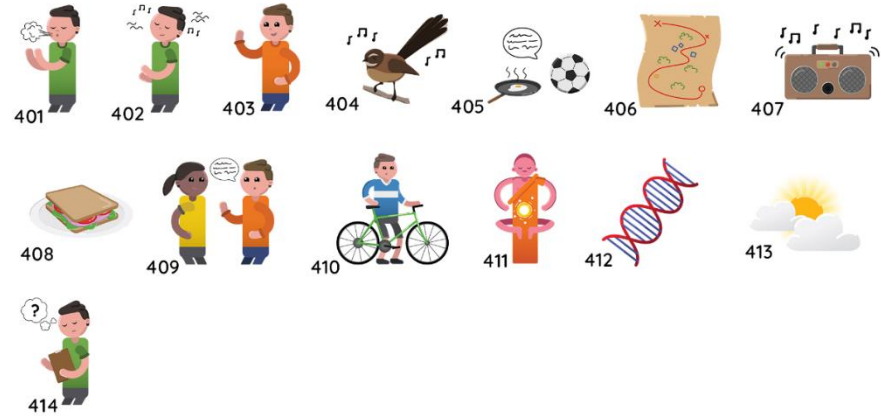
Appendix D: *Match Emoji* Images

Appendix E: Example of Micro-Messages in *Match Emoji*

Number	Message	Set	Purpose & Therapeutic Underpinning
1	Kia ora! Welcome to Match Emoji, a simple and quirky game to help relax and chill the mind.	1 (**Intro**)	Welcome the player to the game.
2	This game is likely candy-crush but free with actual real-life hints!	1	Help players understand that the game is unique, and it might offer opportunities to try some new ways of managing emotions
3	Match Emoji is a little different, the popups are hints for dealing with tricky emotions that might sneak up.	1	Help players understand the similarities with more popular games such as Candy Crush.
4	Some pop-ups and ideas might be helpful for uplifting your mood.	1	Explaining that some of the ideas might be useful.
5	However, some pop ups and ideas might be a bit cheesy and that's fine.	1	Explaining that some of the ideas might not sit well with the player. However, this is normal.
6	Just like when are playing Match Emoji, we can have happy emotions {Happy Emoji]	2 (Happy Emoji)	Introducing the 'happy' emoji.
7	These happy emojis can pop up and make us feel GOOD AS or AWESOME	2	Use developmentally appropriate/common terminological to discuss the happy emoji.
8	Happy emojis can make you smile and feel like we can do anything!	2	Use developmentally appropriate/common terminological to discuss the happy emoji.

Appendix F: Table of Studies Included in Systematic Review

TABLE 2. DESCRIPTION of THE STUDIES INCLUDED IN THIS REVIEW

	First author and year	Casual videogame	Aim	Population (N)	Outcome measures	Results
1.	Fish et al. (2018)	''Plants vs. Zombies''	To compare a prescribed regimen of 30–45 minutes of CVG play with an SSRI medication with a traditional two-medication regimen for decreasing symptoms of state anxiety and trait anxiety	Psychiatrists treating adult clinical populations approached participants. Fifty-four met the criteria and participated in the study.	The State–Trait Anxiety Inventory (STAI)	Playing a CVG under a prescribed condition of reduced state anxiety symptom severity and had a medium effect on trait anxiety compared with the medication-only intervention. This significant decrease in state anxiety scores was found after the 1-month prescription of CVG play.
2.	Fish et al. (2014)	''Bejeweled 2,'' ''Peggle,'' and ''Bookworm Adventures''	To determine the effects of CVG play when used as a prescribed intervention three times per week for 30 minutes over a 1-month period for reducing symptoms of anxiety in a depressed population.	Fifty-nine participants were recruited through word of mouth and a recruitment flyer distributed to local mental practitioners.	STAI	The prescribed regimen of CVG play reduced anxiety symptom severity. Furthermore, participants played an average of 10.7 minutes longer than prescribed.
3.	Russoniello et al. (2013)	''Bejeweled 2,'' ''Peggle,'' and ''Bookworm Adventures''	To examine whether a prescribed regimen of CVG play for at least 30 minutes three times per week for 1 month could reduce symptoms associated with depression.	Fifty-nine participants were recruited through word of mouth and distributing a recruitment flier to possible referral sources.	PHQ-9	A prescribed regimen of playing CVGs significantly reduced symptoms of clinical depression. These results were found during the study and at the end of the 1-month study.
4.	Horovitz et al. (2016)	''Bubble shooter''	Researchers aimed to test the effects of a single-session attentional bias modification training (ABMT) game in reducing state anxiety among a nonclinical population while waiting for a dental procedure.	Seventy-one participants who were seeking treatment in a private dental clinic took part in the study.	Modified dental anxiety scale (MDAS), STAI, and overall subjective evaluation scale	Distraction tasks such as a CVG have a better immediate effect than ABMT in alleviating state anxiety in nonanxious individuals awaiting a dental appointment.

(*continued*)

TABLE 2. (CONTINUED)

	First author and year	Casual videogame	Aim	Population (N)	Outcome measures	Results
5.	Russoniello et al. (2009a)	"Bejeweled 2," "Bookworm Adventures," and "Peggle"	To test the brain and heart rate effects of CVGs on mood and stress by comparing people playing CVGs with control subjects under similar conditions.	A total of 134 participants were recruited through fliers around the campus community and consisted of students, faculty members, and staff at the university.	Electroencephalography (EEG) and heart rate variability (HRV).	"Bejeweled 2" decreased left alpha brain waves associated with a decrease in withdrawal and depressive-type behaviors. "Peggle" increased right alpha brain wave activity associated with excitement or euphoric behaviors. "Bookworm Adventures" increased the stability of alpha brain waves between the left and right sides of the brain.
6.	Russoniello et al. (2009)	"Bejeweled 2"	Investigated EEG, HRV, and psychological correlates while playing a specific CVG called "Bejeweled 2."	Sixty-nine participants were included in the study.	Profile of mood states (POMS), EEG, and HRV.	Researchers reported that playing a CVG such as "Bejeweled 2" can increase mood and decrease stress. More specifically, EEG and HRV parameters reported changes associated with improvements in mood.
7.	Russoniello et al. (2019)	"Plants vs. Zombies"	To compare a prescribed regimen of 30–45 minutes of CVG play with a second antidepressant medication regimen for decreasing treatment-resistant depression symptoms (TRDS) and improving HRV.	Forty-nine participants who were actively taking a prescribed antidepressant and had expressed concerns after follow-up evaluations took part in the study.	Quick inventory of depressive symptomatology (QIDS), PHQ-9, and HRV.	A prescribed dosage of CVGs outperformed the second antidepressant medication regimen in the clinical trial. A single 30-minute session of playing the CVG was significantly more effective in reducing TRDS when compared with the antidepressant medication.
8.	Rupp et al. (2017)	"Sushi Cat 2"	To investigate the effects of a passive break, relaxation activity, and CVG on affect, stress, engagement, and cognitive performance.	Sixty-six undergraduate students took part in the study for course credit.	Affective and cognitive assessments (ACA). These included the Positive and Negative Affect Schedule, shortened version of the Dundee Stress State Questionnaire, and backward digit span	Playing the CVG showed greater engagement and affective restoration than the relaxation condition. The break condition slightly decreased affect and prevented cognitive restoration. Playing a CVG even briefly restored individuals' affective abilities.

(*continued*)

TABLE 2. (CONTINUED)

	First author and year	Casual videogame	Aim	Population (N)	Outcome measures	Results
9.	Pieters et al. (2016)	"IMPACT"	To explore the effects of a visual search ABM game, called "Intrinsically Motivating Playable Attentional Control Training" on attention bias processes and mood in undergraduate participants.	Fifty-eight undergraduate students participated in study 1 and 82 in study 2 for financial compensation	Mood and Anxiety Symptoms Questionnaire (MASQ), emotional visual search task (EVST), Ruminative Response Scale (RRS), and visual analog scales (VASs)	Although training performance significantly improved, researchers were unable to show direct effects of ABMT on attention patterns or stress levels.
10.	Dennis-Tiwary et al. (2016)	"Personal Zen"	To investigate the effects of a gamified ABMT for reducing anxiety among trait anxious adults.	Forty-two undergraduate students were recruited from a university and through Craigslist.	STAI, EEG, POMS, Beck Depression Inventory II (BDI-II), Social Stress Test (TSST), and dot probe task.	Results demonstrate that a single session of gamified AMBT improved performance during an anxiety-related stress task only among females.
11.	Dennis-Tiwary et al. (2017)	"Personal Zen"	Researchers tested whether a gamified ABMT could reduce prenatal threat bias, anxiety, and stress among 29 women who were in their 19th–29th week of pregnancy.	Study recruiters asked women who were receiving prenatal treatment from a hospital who were between their 19th and 29th week of pregnancy. Twenty-nine women agreed to participate.	The Depression, Anxiety, and Stress Scale (DASS-21), the Hamilton Anxiety Scale (HAM-A), TSST, dot probe task, cortisol, and EEG.	Results showed lower levels of threat bias and laboratory cortisol following ABMT versus placebo training. Although the main effect was not significant and varied with individuals, the use of the ABMT game reduced biobehavioral indices of prenatal stress and anxiety.
12.	Dennis and O'Toole (2014)	"Personal Zen"	Examined effects of a gamified ABMT game among highly trait anxious participants.	Seventy-eight undergraduate students were recruited and met the criteria for the study.	STAI, POMS, BDI-II, TSST, and dot probe task.	One session lasting 25 minutes of the active compared with placebo training reduced subjective anxiety and observed stress reactivity.
13.	Parnandi and Gutierrez-Osuna (2017)	"Frozen Bubble"	Examined the effectiveness of a breathing-based CVG under three different biofeedback modalities for reducing stress and promoting relaxation.	Twenty-five participants aged between 19–33 years took part in the study.	Electrodermal activity, HRV, and breathing rate.	Results show that a breathing-based game with biofeedback (BR-GBF) is more effective than the other groups in terms of lowering arousal during the treatment and transferring relaxation skills to a subsequent acute stressor.

CVG, casual videogame; SSRI, selective serotonin reuptake inhibitors.

7

References

Abuhamdeh, S., & Csikszentmihalyi, M. (2012). The importance of challenge for the enjoyment of intrinsically motivated, goal-directed activities. *Personality and Social Psychology Bulletin*, *38*(3), 317–330. https://doi.org/10.1177/0146167211427147

Aizenstros, A., Bakker, D., Hofmann, S. G., Curtiss, J., & Kazantzis, N. (2021). Engagement with smartphone-delivered behavioural activation interventions: A study of the *MoodMission*smartphone application. *Behavioural and Cognitive Psychotherapy*, *49*(5), 569–581. https://doi.org/10.1017/S1352465820000922

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders*. https://doi.org/10.1176/Appl.books.9780890425596

Andrade, C. (2020). The limitations of online surveys. *Indian Journal of Psychological Medicine*, *42*(6), 575–576. https://doi.org/10.1177/0253717620957496

Andrade, L. H., Alonso, J., Mneimneh, Z., Wells, J. E., Al-Hamzawi, A., Borges, G., Bromet, E., Bruffaerts, R., de Girolamo, G., de Graaf, R., Florescu, S., Gureje, O., Hinkov, H. R., Hu, C., Huang, Y., Hwang, I., Jin, R., Karam, E. G., Kovess-Masfety, V., … Kessler, R. C. (2014). Barriers to mental health treatment: Results from the WHO world mental health surveys. *Psychological Medicine*, *44*(6), 1303–1317. https://doi.org/10.1017/S0033291713001943

Antezana, G., Venning, A., Smith, D., Bidargaddi, N., & Antezana, G. (2022). Do young men and women differ in well-being apps usage? Findings from a randomised trial, *Health Informatics Journal 28*(1), 146045822110648. https://doi.org/10.1177/14604582211064825

Arango, C., Díaz-Caneja, C. M., McGorry, P. D., Rapoport, J., Sommer, I. E., Vorstman, J. A., McDaid, D., Marín, O., Serrano-Drozdowskyj, E., Freedman, R., & Carpenter, W. (2018). Preventive strategies for mental health. *The Lancet Psychiatry 5*(7) pp. 591–604). Elsevier Ltd. https://doi.org/10.1016/S2215-0366(18)30057-9

August, G. J., Piehler, T. F., & Miller, F. G. (2018). Getting "SMART" about implementing multi-tiered systems of support to promote school mental health. *Journal of School Psychology*, *66*(85). https://doi.org/10.1016/J.JSP.2017.10.001

Bakker, D., Kazantzis, N., Rickwood, D., & Rickard, N. (2016). Mental health smartphone apps: Review and evidence-based recommendations for future developments. In *JMIR Mental Health*, *3*(1). https://doi.org/10.2196/mental.4984

Bakker, D., Kazantzis, N., Rickwood, D., & Rickard, N. (2018). A randomized controlled trial of three smartphone apps for enhancing public mental health. *Behaviour Research and Therapy*, *109*, 75–83. https://doi.org/10.1016/J.BRAT.2018.08.003

Bakker, D., & Rickard, N. (2019). Engagement with a cognitive behavioural therapy mobile phone app predicts changes in mental health and wellbeing: MoodMission. *Australian Psychologist*, *54*(4), 245–260. https://doi.org/10.1111/AP.12383

Baniqued, P. L., Kranz, M. B., Voss, M. W., Lee, H., Cosman, J. D., Severson, J., & Kramer, A. F. (2013). Cognitive training with casual video games: points to consider. *Frontiers in Psychology*, *4*(1). https://doi.org/10.3389/FPSYG.2013.01010

Barbour, R., & Kitzinger, J. (2011). Developing focus group research. *Focus Group Research*. https://doi.org/10.4135/9781849208857

Baselmans, B. M. L., van de Weijer, M. P., Abdellaoui, A., Vink, J. M., Hottenga, J. J., Willemsen, G., Nivard, M. G., de Geus, E. J. C., Boomsma, D. I., & Bartels, M. (2019). A genetic investigation of the well-being spectrum. *Behavior Genetics*, *49*(3), 286–297. https://doi.org/10.1007/s10519-019-09951-0

Baumel, A., Fleming, T., & Schueller, S. M. (2020). Digital micro interventions for behavioral and mental health gains: Core components and conceptualization of digital micro intervention care. *Journal of Medical Internet Research*, *22*(10). https://doi.org/10.2196/20631

Baumel, A., Muench, F., Edan, S., & Kane, J. M. (2019). Objective user engagement with mental health apps: Systematic search and panel-based usage analysis. *Journal of Medical Internet Research*, *21*(9). https://doi.org/10.2196/14567

Beale, I. L., Kato, P. M., Marin-Bowling, V. M., Guthrie, N., & Cole, S. W. (2007). Improvement in cancer-related knowledge following use of a psychoeducational video game for adolescents and young adults with cancer. *Journal of Adolescent Health*, *41*(3), 263–270. https://doi.org/10.1016/J.jadohealth.2007.04.006

Bennike, I. H., Wieghorst, A., & Kirk, U. (2017). Online-based mindfulness training reduces behavioral markers of mind wandering. *Journal of Cognitive Enhancement*, *1*(2), 172–181. https://doi.org/10.1007/s41465-017-0020-9

Bentall, R. P., de Sousa, P., Varese, F., Wickham, S., Sitko, K., Haarmans, M., & Read, J. (2014). From adversity to psychosis: Pathways and mechanisms from specific adversities to specific symptoms. In *Social Psychiatry and Psychiatric Epidemiology, 49*(7). https://doi.org/10.1007/s00127-014-0914-0

Bhugra, D., Till, A., & Sartorius, N. (2013). What is mental health? *International Journal of Social Psychiatry, 59*(1). https://doi.org/10.1177/0020764012463315

Blakemore, S. J., & Choudhury, S. (2006). Development of the adolescent brain: implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry*, *47*(4), 296–312. https://doi.org/10.1111/J.1469-7610.2006.01611.X

Blum, R. W. (2020). Gender norm transformative programing: Where are we now? Where do we need to be? *The Journal of adolescent health: official publication of the Society for Adolescent Medicine 66*(2). NLM (Medline). https://doi.org/10.1016/j.jadohealth.2019.11.299

Boaden, K., Tomlinson, A., Cortese, S., & Cipriani, A. (2020). Antidepressants in children and adolescents: Meta-review of efficacy, tolerability and suicidality in acute treatment. *Frontiers in Psychiatry*, *11*, 1. https://doi.org/10.3389

Boaz, A., Hanney, S., Borst, R., O'Shea, A., & Kok, M. (2018). How to engage stakeholders in research: Design principles to support improvement. *Health Research Policy and Systems*, *16*(1), 1–9. https://doi.org/10.1186/S12961-018-0337-6/

Borghouts, J., Eikey, E., Mark, G., de Leon, C., Schueller, S. M., Schneider, M., Stadnick, N., Zheng, K., Mukamel, D., & Sorkin, D. H. (2021). Barriers to and facilitators of user engagement with digital mental health interventions: Systematic review. *Journal of Medical Internet Research*, *23*(3). https://doi.org/10.2196/24387

Bowden, N., Gibb, S., Thabrew, H., Audas, R., Camp, J., Taylor, B., & Hetrick, S. (2019). IDI trends in antidepressant dispensing to New Zealand children and young people between 2007/08 and 2015/16. *NZMJ*, *132*, 1505. www.nzma.org.nz/journal

Bowen, D. J., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., Bakken, S., Kaplan, C. P., Squiers, L., Fabrizio, C., & Fernandez, M. (2009). How we design feasibility studies. *American Journal of Preventive Medicine*, *36*(5), 452. https://doi.org/10.1016/

Bracken, P., Giller, J., & Summerfield, D. (2016). Primum non nocere. The case for a critical approach to global mental health. In *Epidemiology and Psychiatric Sciences* (Vol. 25, Issue 6, pp. 506–510). Cambridge University Press. https://doi.org/10.1017/S2045796016000494

Bramer, W. M., Rethlefsen, M. L., Kleijnen, J., & Franco, O. H. (2017). Optimal database combinations for literature searches in systematic reviews: A prospective exploratory study. *Systematic Reviews*, *6*(1), 1–12. https://doi.org/10.1186/S13643-017-0644

Bridge, J. A., Iyengar, S., Salary, C. B., Barbe, R. P., Birmaher, B., Pincus, H. A., Ren, L., & Brent, D. A. (2007). Clinical response and risk for reported suicidal ideation and suicide attempts in pediatric antidepressant treatment: A meta-analysis of randomized controlled trials. *JAMA*, *297*(15). https://doi.org/10.1001/JAMA.297.15.1683

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, *32*(7), 513–531. https://doi.org/10.1037/0003-066X.32.7.513

Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives on human development.* SAGE.

Brookman-Frazee, L., Stahmer, A., Stadnick, N., Chlebowski, C., Herschell, A., & Garland, A. F. (2016). Characterizing the use of research-community partnerships in studies of evidence-based interventions in children's community services. *Administration and Policy in Mental Health*, *43*(1). https://doi.org/10.1007/S10488-014-0622-9

Bruehlman-Senecal, E., Hook, C. J., Pfeifer, J. H., FitzGerald, C., Davis, B., Delucchi, K. L., Haritatos, J., & Ramo, D. E. (2020). Smartphone app to address loneliness among college students: Pilot randomized controlled trial. *JMIR Mental Health. 7(*10)e21496. https://doi.org/10.2196/21496

Bunyi, J., Ringland, K. E., & Schueller, S. M. (2021). Accessibility and digital mental health: Considerations for more accessible and equitable mental health apps. *Frontiers in Digital Health*, *3*, 742196. https://doi.org/10.3389/FDGTH.2021.742196

Carruthers, S., Pickles, A., Slonims, V., Howlin, P., & Charman, T. (2020). Beyond intervention into daily life: A systematic review of generalisation following social communication interventions for young children with autism. *Autism Research*, *13*(4), 506–522. https://doi.org/10.1002/AUR.2264

Caskey, M., & Anfara, V. A. (2007). Research summary: Young adolescents' developmental characteristics. Retrieved 6/14/2021, from http://www.nmsa.org/Research/ResearchSummaries/ DevelopmentalCharacteristics/tabid/1414/Default.aspx

Cavanagh, K., Strauss, C., Cicconi, F., Griffiths, N., Wyper, A., & Jones, F. (2013). A randomised controlled trial of a brief online mindfulness-based intervention. *Behaviour Research and Therapy*, *51*(9), 573–578. https://doi.org/10.1016/j.brat.2013.06.003

Champion, L., Economides, M., & Chandler, C. (2018). The efficacy of a brief app-based mindfulness intervention on psychosocial outcomes in healthy adults: A pilot randomised controlled trial. *PLoS ONE*, *13*(12). https://doi.org/10.1371/journal.pone.0209482

Chan, A. W., Tetzlaff, J. M., Altman, D. G., Laupacis, A., Gøtzsche, P. C., Krleža-Jerić, K., Hróbjartsson, A., Mann, H., Dickersin, K., Berlin, J. A., Doré, C. J., Parulekar, W. R., Summerskill, W. S. M., Groves, T., Schulz, K. F., Sox, H. C., Rockhold, F. W., Rennie, D., & Moher, D. (2013). SPIRIT 2013 statement: defining standard protocol items for clinical trials. *Annals of Internal Medicine*, *158*(3), 200–207. https://doi.org/10.7326/0003-4819-158-3-201302050-00583

Chandrashekar, P. (2018). Do mental health mobile apps work: evidence and recommendations for designing high-efficacy mental health mobile apps. *MHealth*, *4*, 6–6. https://doi.org/10.21037

Chesham, A., Wyss, P., Müri, R. M., Mosimann, U. P., & Nef, T. (2017). What older people like to lay: Genre preferences and acceptance of casual games. *JMIR Serious Games*, *5*(2), e8. https://doi.org/10.2196/games.7025

Chu, G. M., Goger, P., Malaktaris, A., & Lang, A. J. (2022). The role of threat appraisal and coping style in psychological response to the COVID-19 pandemic among university students. *Journal of Affective Disorders Reports*, *8*, 100325. https://doi.org/10.1016/J.JADR.2022.100325

Cipriani, A., Furukawa, T. A., Salanti, G., Geddes, J. R., Higgins, J. P. T., Churchill, R., Watanabe, N., Nakagawa, A., Omori, I. M., Mcguire, H., Tansella, M., & Barbui, C. (2009). Comparative efficacy and acceptability of 12 new-generation antidepressants: a multiple-treatments meta-analysis. *The Lancet*. https://doi.org/10.1016/S0140

Clark, T. C., le Grice, J., Moselen, E., Fleming, T., Crengle, S., Tiatia-Seath, J., & Lewycka, S. (2018). Health and wellbeing of Māori secondary school students in New Zealand: Trends between 2001, 2007 and 2012. *Australian and New Zealand Journal of Public Health*, *42*(6), 553–561. https://doi.org/10.1111/1753-6405.12839

Clarke, S., Arnab, S., Dunwell, I., & Brown, K. (2012). PR:EPARe: A game-based approach to relationship guidance for adolescents. *Procedia Computer Science*, *15*, 38–44. https://doi.org/10.1016/J.PROCS.2012.10.056

Cleare, A., Pariante, C. M., Young, A. H., Anderson, I. M., Christmas, D., Cowen, P. J., Dickens, C., Ferrier, I. N., Geddes, J., Gilbody, S., Haddad, P. M., Katona, C., Lewis, G., Malizia, A., McAllister-Williams, R. H., Ramchandani, P., Scott, J., Taylor, D., & Uher, R. (2015). Evidence-based guidelines for treating depressive disorders with antidepressants: A revision of the 2008 British Association for Psychopharmacology guidelines. *Journal of Psychopharmacology (Oxford, England)*, *29*(5), 459–525. https://doi.org/10.1177/0269881115581093

Cobham, V. E., Hickling, A., Kimball, H., Thomas, H. J., Scott, J. G., & Middeldorp, C. M. (2019). Systematic review: Anxiety in children and adolescents with chronic medical conditions. www.jaacap.org

Cohen, Z. P., Cosgrove, K. T., DeVille, D. C., Akeman, E., Singh, M. K., White, E., Stewart, J. L., Aupperle, R. L., Paulus, M. P., & Kirlic, N. (2021). The Impact of COVID-19 on adolescent mental health: Preliminary findings from a longitudinal sample of healthy and at-risk adolescents. *Frontiers in Pediatrics*, *9*, 440. https://doi.org/10.3389/FPED.2021.622608/BIBTEX

Colizzi, M., Lasalvia, A., & Ruggeri, M. (2020). Prevention and early intervention in youth mental health: is it time for a multidisciplinary and trans-diagnostic model for care?

International Journal of Mental Health Systems 2020 14:1, *14*(1), 1–14. https://doi.org/10.1186/S13033-020-00356-9

Consumer Acquisition. (2020). *What are Casual Games in the Video Industry? | Consumer Acquisition*. https://www.consumeracquisition.com/faq/what-are-casual-games

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention.* Harper/Collins. https://digitalauthorshipuri.files.wordpress.com/2016/01/csikszentmihalyi-chapter-flow-and-creativity.pdf

Cuijpers, P., van Straten, A., Warmerdam, L., & Andersson, G. (2008). Psychological treatment of depression: A meta-analytic database of randomized studies. *BMC Psychiatry*, *8*. https://doi.org/10.1186/1471-244X-8-36

Cummings, A. (2022). The views of mental health professionals who use digital methods to support care-experienced young people. 1–16. https://doi.org/10.1080/09503153.2022.2044769

Dane, A., Gebbink, A.-S. K., & Kuy, P. H. M. van der. (2021). The importance of publishing research protocols for pharmacoeconomic studies. *European Journal of Hospital Pharmacy*, ejhpharm-2021-002987. https://doi.org/10.1136/EJHPHARM-2021-002987

Dane, A., Klein Gebbink, A.-S., & van der Kuy, P. H. M. (2021). The importance of publishing research protocols for pharmacoeconomic studies. *European Journal of Hospital Pharmacy: Science and Practice*, ejhpharm-2021-002987. https://doi.org/10.1136/EJHPHARM-2021-002987

Darbyshire, P., MacDougall, C., & Schiller, W. (2016). Multiple methods in qualitative research with children: more insight or just more? *Qualitative Research 5*(4), 417–436. https://doi.org/10.1177/1468794105056921

David, O., Costescu, C., Cardos, R., Mogoaşe, C., & Alexandra O, (2020). How effective are serious games for promoting mental health and health behavioral change in children and adolescents? *ERIC*. *49*, 817–838. https://doi.org/10.1007/s10566-020-09566-1

Donker, T., Petrie, K., Proudfoot, J., Clarke, J., Birch, M. R., & Christensen, H. (2013). Smartphones for smarter delivery of mental health programs: A systematic review. *J Med Internet Res 2013;15(11):E247*. https://doi.org/10.2196/JMIR.2791

Donkin, L., Christensen, H., Naismith, S. L., Neal, B., Hickie, I. B., & Glozier, N. (2011). A systematic review of the impact of adherence on the effectiveness of e-therapies. *Journal of Medical Internet Research*, *13*(3). https://doi.org/10.2196/JMIR.1772

Dörner, R., Göbel, S., Effelsberg, W., & Wiemeyer, J. (2016). *Serious games foundations, concepts and practice*. Springer.

Doucet, S. A., Letourneau, N. L., & Stoppard, J. M. (2010). Contemporary paradigms for research related to women's mental health. *Health Care for Women International*, *31*(4), 296–312. https://doi.org/10.1080/07399330903518509

Drechsler, R., Straub, M., Doehnert, M., Heinrich, H., Steinhausen, H. C., & Brandeis, D. (2007). Controlled evaluation of a neurofeedback training of slow cortical potentials in children with Attention Deficit/Hyperactivity Disorder (ADHD). *Behavioral and Brain Functions*, *3*(1), 1–13. https://doi.org/10.1186/1744-9081-3-35/FIGURES/4

Durie, M. (2006). *New Zealand treasury guest lecture series: Measuring Māori wellbeing*. Wellington.

East, M. L., & Havard, B. C. (2015). Mental health mobile apps: From infusion to diffusion in the mental health social system. *JMIR Mental Health*, *2*(1), e10. https://doi.org/10.2196/mental.3954

Ebert, D. D., Zarski, A. C., Christensen, H., Stikkelbroek, Y., Cuijpers, P., Berking, M., & Riper, H. (2015). Internet and computer-based cognitive behavioral therapy for anxiety and depression in youth: a meta-analysis of randomized controlled outcome trials. *PloS One*, *10*(3). https://doi.org/10.1371

ECH Alliance. (2020). *The global connector for digital health a special foreword by echalliance chair.*

Edridge, C., Wolpert, M., Deighton, J., & Edbrooke-Childs, J. (2020). An mHealth intervention (ReZone) to help young people self-manage overwhelming feelings: Cluster-randomized controlled trial. *J Med Internet Res 2020;22(7):E14223 Https://Www.Jmir.Org/2020/7/E14223*, *22*(7), e14223. https://doi.org/10.2196/14223

Edwards, R. T., Jones, C., Berry, V., Charles, J., Linck, P., Bywater, T., Hutchings, J., Chan, S., Leung, C., & Sanders, M. (2016). Incredible years parenting programme: cost-effectiveness and implementation. *Journal of Children's Services*, *11*, 25–37. https://doi.org/10.1108/JCS-02-2015-0005

Edwards, S., McCreanor, T., & Moewaka-Barnes, H. (2007). Maori family culture: A context of youth development in Counties/Manukau. *Kotuitui: New Zealand Journal of Social Sciences Online*, *2*(1), 1–15. https://doi.org/10.1080/1177083x.2007.9522420

Emmons, R. A., & Mccullough, M. E. (2003). Counting Blessings Versus Burdens: An experimental investigation of gratitude and subjective well-being in daily life. *Journal of Personality and Social Psychology*, *84*(2), 377–389. https://doi.org/10.1037/0022-3514.84.2.377

Entertainment Software Association. (2020). *2020 Essential facts about the video game industry.* https://www.theesa.com/resource/2020-essential-facts/

Erikson, E. (1956). *Young man Luther: A study in psychoanalysis and history*. W. W. Norton & Company. http://www.amazon.com/Young-Man-Luther-Psychoanalysis-Monograph/dp/0393310361

Faggion, C. M., & Diaz, K. T. (2019). Overview authors rarely defined systematic reviews that are included in their overviews. *J Clin Epidemiol*, *109*, 70–79.

Fairburn, C. G., & Patel, V. (2017). The impact of digital technology on psychological treatments and their dissemination. *Behaviour Research and Therapy*, *88*, 19. https://doi.org/10.1016/J.BRAT.2016.08.012

Fazel, S., Wolf, A., Palm, C., & Lichtenstein, P. (2014). Violent crime, suicide, and premature mortality in patients with schizophrenia and related disorders: A 38-year total population study in Sweden. *The Lancet Psychiatry*, *1*(1), 44–54. https://doi.org/10.1016/S2215-0366(14)70223-8

Fish, M. T., Russoniello, C. v., & O'Brien, K. (2018). Zombies vs. Anxiety: An augmentation study of prescribed video game play compared to medication in reducing anxiety symptoms. *Simulation and Gaming*, *49*(5), 553–566. https://doi.org/10.1177/1046878118773126

Fledderus, M., Bohlmeijer, E. T., Smit, F., & Westerhof, G. J. (2010). Mental health promotion as a new goal in public mental health care: A randomized controlled trial of an intervention enhancing psychological flexibility. *American Journal of Public Health*, *100*(12), 2372–2378. https://doi.org/10.2105/AJPH.2010.196196

Fleming, T., Bavin, L., Lucassen, M., Stasiak, K., Hopkins, S., & Merry, S. (2018). *Beyond the trial: Systematic review of real-world uptake and engagement with digital self-help interventions for depression, low mood, or anxiety*. https://doi.org/10.26686

Fleming, T., Dixon, R., Frampton, C., & Merry, S. (2012). A pragmatic randomized controlled trial of computerized CBT (*SPARX*) for symptoms of depression among adolescents excluded from mainstream education. *Behavioural and Cognitive Psychotherapy*, *40*(5), 529–541. https://doi.org/10.1017/S1352465811000695

Fleming, T. M., Bavin, L., Stasiak, K., Hermansson-Webb, E., Merry, S. N., Cheek, C., Lucassen, M., Lau, H. M., Pollmuller, B., & Hetrick, S. (2017). Serious games and gamification for mental health: Current status and promising directions. *Frontiers in Psychiatry*, *7*(JAN), 215. https://doi.org/10.3389/FPSYT.2016.00215/BIBTEX

Fleming, T. M., de Beurs, D., Khazaal, Y., Gaggioli, A., Riva, G., Botella, C., Baños, R. M., Aschieri, F., Bavin, L. M., Kleiboer, A., Merry, S., Lau, H. M., & Riper, H. (2016). Maximizing the impact of e-therapy and serious gaming: Time for a paradigm shift. *Frontiers in Psychiatry*, *7*(APR). https://doi.org/10.3389/fpsyt.2016.00065

Fleming, T., Merry, S., Stasiak, K., Hopkins, S., Patolo, T., Ruru, S., Latu, M., Shepherd, M., Christie, G., & Goodyear-Smith, F. (2019). The importance of user segmentation for designing digital therapy for adolescent mental health: Findings from scoping processes. *JMIR Mental Health*, *6*(5). https://doi.org/10.2196/12656

Flett, J. A. M., Hayne, H., Riordan, B. C., Thompson, L. M., & Conner, T. S. (2019). Mobile mindfulness meditation: A randomised controlled trial of the effect of two popular apps on mental health. *Mindfulness*, *10*(5), 863–876. https://doi.org/10.1007/s12671-018-1050-9

Forbes, E. E., & Dahl, R. E. (2010). Pubertal development and behavior: Hormonal activation of social and motivational tendencies. In *Brain and Cognition* (Vol. 72, Issue 1, pp. 66–72). https://doi.org/10.1016/j.bandc.2009.10.007

Ford, T., Hayes, R., Byford, S., Edwards, V., Fletcher, M., Logan, S., Norwich, B., Pritchard, W., Allen, K., Allwood, M., Ganguli, P., Grimes, K., Hansford, L., Longdon, B., Norman, S., Price, A., & Ukoumunne, O. C. (2018). Psychological medicine the effectiveness and cost-effectiveness of the incredible years teacher classroom management programme in primary school children: results of the stars cluster randomised controlled trial. *Psychological Medicine* 12(2). https://doi.org/10.1017/S0033291718001484

Fordham, B., Sugavanam, T., Edwards, K., Stallard, P., Howard, R., das Nair, R., Copsey, B., Lee, H., Howick, J., Hemming, K., & Lamb, S. E. (2021). The evidence for cognitive behavioural therapy in any condition, population or context: a meta-review of systematic reviews and panoramic meta-analysis. *Psychological Medicine*, *51*(1), 21–29. https://doi.org/10.1017/S0033291720005292

Froh, J. J., Sefick, W. J., & Emmons, R. A. (2008). Counting blessings in early adolescents: An experimental study of gratitude and subjective well-being. *Journal of School Psychology*, *46*, 213–233. https://doi.org/10.1016/j.jsp.2007.03.005

Fusar-Poli, P., Correll, C. U., Arango, C., Berk, M., Patel, V., & Ioannidis, J. P. A. (2021). Preventive psychiatry: A blueprint for improving the mental health of young people. *World Psychiatry: Official Journal of the World Psychiatric Association (WPA)*, *20*(2), 200–221. https://doi.org/10.1002/WPS.20869

Gamlen, A., & McIntyre, C. (2018). Mixing methods to explain emigration policies: A post-positivist perspective. *Journal of Mixed Methods Research*, *12*(4), 374–393. https://doi.org/10.1177/1558689818782822

Ganeshkumar, P., & Gopalakrishnan, S. (2013). Systematic reviews and meta-analysis: Understanding the best evidence in primary healthcare. *Journal of Family Medicine and Primary Care*, *2*(1), 9. https://doi.org/10.4103/2249-4863.109934

Garber, J., Frankel, S. A., & Herrington, C. G. (2016). Developmental demands of cognitive behavioral therapy for depression in children and adolescents: cognitive, social, and emotional processes. *Annual Review of Clinical Psychology*, *12*, 181–216. https://doi.org/10.1146/annurev-clinpsy-032814-112836

Gardner, F., Burton, J., & Klimes, I. (2006). Randomised controlled trial of a parenting intervention in the voluntary sector for reducing child conduct problems: outcomes and mechanisms of change. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *47*(11), 1123–1132. https://doi.org/10.1111/j.1469-7610.2006.01668.x

Gardner, S. (2018). Psychological aspects of early treatment interventions. *Releasing Resources to Achieve Health Gain*, 143–148. https://doi.org/10.1201/9781315379753-18

Garrido, S., Millington, C., Cheers, D., Boydell, K., Schubert, E., Meade, T., & Nguyen, Q. V. (2019). What works and what doesn't work? A systematic review of digital mental health interventions for depression and anxiety in young people. *Frontiers in Psychiatry*, *10*, 759. https://doi.org/10.3389/FPSYT.2019.00759/BIBTEX

Gibbons & Poelker. (2019). *Adolescent development in a cross-cultural perspective*.

Goodyear, V. A., & Armour, K. M. (2021). Young People's health-related learning through social media: What do teachers need to know? *Teaching and Teacher Education*, *102*. https://doi.org/10.1016/J.TATE.2021.103340

Granieri, A., Franzoi, I. G., & Chung, M. C. (2021). Editorial: Psychological distress among university students. *Frontiers in Psychology* (Vol. 12). Frontiers Media S.A. https://doi.org/10.3389/fpsyg.2021.647940

Greco, L. A., Baer, R. A., & Smith, G. T. (2011). Assessing mindfulness in children and adolescents: development and validation of the Child and Adolescent Mindfulness Measure (CAMM). *Psychological Assessment*, *23*(3), 606–614. https://doi.org/10.1037/A0022819

Greenberg, M. T., Kusche, C. A., Cook, E. T., & Quamma, J. P. (1995). Promoting emotional competence in school-aged children: The effects of the PATHS curriculum. *Development and Psychopathology*, *7*(1), 117–136. https://doi.org/10.1017/S0954579400006374

Grégoire, S., Lachance, L., Bouffard, T., & Dionne, F. (2018). *The use of acceptance and commitment therapy to promote mental health and school engagement in university students: A multisite randomized controlled trial*. www.elsevier.com/locate/bt

Gutman, L. M., & Eccles, J. S. (2007). Stage-environment fit during adolescence: Trajectories of family relations and adolescent outcomes. *Developmental Psychology*, *43*(2), 522–537. https://doi.org/10.1037/0012-1649.43.2.522

Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes, and outcomes. *Behaviour Research and Therapy*, *44*(1), 1–25. https://doi.org/10.1016/j.brat.2005.06.006

Hetrick, S. E., McKenzie, J. E., Bailey, A. P., Sharma, V., Moller, C. I., Badcock, P. B., Cox, G. R., Merry, S. N., & Meader, N. (2021). New generation antidepressants for depression in children and adolescents: a network meta-analysis. In *Cochrane Database of Systematic Reviews* (Vol. 2021, Issue 5). John Wiley and Sons Ltd. https://doi.org/10.1002/14651858.CD013674.pub2

Holmes, E. A., James, E. L., Coode-Bate, T., & Deeprose, C. (2009). Can playing the computer game "Tetris" reduce the build-up of flashbacks for trauma? A proposal from cognitive science. *PLoS ONE*, *4*(1). https://doi.org/10.1371/journal.pone.0004153

Howells, A., Ivtzan, I., & Eiroa-Orosa, F. J. (2016). Putting the 'app' in happiness: A randomised controlled trial of a smartphone-based mindfulness intervention to enhance wellbeing. *Journal of Happiness Studies*, *17*(1), 163–185. https://doi.org/10.1007/s10902-014-9589-1

Huckvale, K., Torous, J., & Larsen, M. E. (2019). Assessment of the data sharing and privacy practices of smartphone apps for depression and smoking cessation. *JAMA Network Open*, *2*(4), e192542–e192542. https://doi.org/10.1001/JAMANETWORKOPEN.2019.2542

Huppert, F. A. (2009). Psychological well-being: Evidence regarding its causes and consequences. *Applied Psychology: Health and Well-Being*, *1*(2), 137–164. https://doi.org/10.1111/J.1758-0854.2009.01008.X

Hutchings, J., & Bywater, T. (2013). *Reflections from group leader supervision delivering the incredible years parent programme to foster carers in Wales*. https://doi.org/10.1177/0308575913477075

Huygens, I., Black, R., & Hamerton, H. (1998). *Reflections on Pakeha identity*. 13–16. https://www.psychology.org.nz/journal-archive/Reflections-on-Pakeha-Identity.pdf

Iyadurai, L., Visser, R. M., Lau-Zhu, A., Porcheret, K., Horsch, A., Holmes, E. A., & James, E. L. (2019). Intrusive memories of trauma: A target for research bridging cognitive science and its clinical application. *Clinical Psychology Review*, *69*, 67. https://doi.org/10.1016/J.CPR.2018.08.005

Jeffrey E. Brand, Jan Jervis, Patrice M. Huggins, & Tyler W. Wilson. (2020). *Digital New Zealand.* Eveleigh, NSW: IGEA.

Jimison, H., Pavel, M., McKanna, J., & Pavel, J. (2004). Unobtrusive monitoring of computer interactions to detect cognitive status in elders. *IEEE Transactions on*

Information Technology in Biomedicine, 8(3), 248–252. https://doi.org/10.1109/TITB.2004.835539

Jindal-Snape, D., Symonds, J. E., Hannah, E. F. S., & Barlow, W. (2021). Conceptualising primary-secondary school transitions: A systematic mapping review of worldviews, theories and frameworks. *Frontiers in Education*, 6, 52. https://doi.org/10.3389/FEDUC.2021.540027/BIBTEX

Journal, A. I., & Henderson, K. A. (2011). Post-positivism and the pragmatics of leisure research. *Https://Doi.Org/10.1080/01490400.2011.583166*, 33(4), 341–346. https://doi.org/10.1080/01490400.2011.583166

Karmakar, S., Dhar, R., & Jee, B. (2020). Covid-19: research methods must be flexible in a crisis. *BMJ*, 370, 1847. https://doi.org/10.1136/BMJ.M2668

Kashani, j, & Carlson, G. (1985). Major depressive disorder in a preschooler. *Journal of the American Academy of Child Psychiatry*, 24, 490–494. https://doi.org/10.1016/S0002-7138(09)60570-7

Kessler, H., Schmidt, A. C., James, E. L., Blackwell, S. E., von Rauchhaupt, M., Harren, K., Kehyayan, A., Clark, I. A., Sauvage, M., Herpertz, S., Axmacher, N., & Holmes, E. A. (2020). Visuospatial computer game play after memory reminder delivered three days after a traumatic film reduces the number of intrusive memories of the experimental trauma. *Journal of Behavior Therapy and Experimental Psychiatry*, 67(December 2018), 101454. https://doi.org/10.1016/j.jbtep.2019.01.006

Khan, K. S., Kunz, R., Kleijnen, J., & Antes, G. (2003). Five steps to conducting a systematic review. *Journal of the Royal Society of Medicine*, 96(3), 118. https://doi.org/10.1258/JRSM.96.3.118

Kim, S., & Wogalter, M. S. (2009). Habituation, dishabituation, and recovery effects in visual warnings. *Habituation, dishabituation, and recovery effects in visual warnings*. https://doi.org/10.1518/107118109X12524444080675

Kitzinger, J., & Barbour, R. S. (2011). Introduction: The challenge and promise of focus groups. *Developing Focus Group Research*, 1–20. https://doi.org/10.4135/9781849208857.N1

Kobau, R., Seligman, M. E. P., Peterson, C., Diener, E., Zack, M. M., Chapman, D., & Thompson, W. (2011). Mental health promotion in public health: perspectives and strategies from positive psychology. *American Journal of Public Health*, 101(8). https://doi.org/10.2105/AJPH.2010.300083

Kuosmanen, T., Fleming, T. M., Newell, J., & Barry, M. M. (2017). A pilot evaluation of the *SPARX*-R gaming intervention for preventing depression and improving wellbeing

among adolescents in alternative education. *Internet Interventions*, *8*, 40–47. https://doi.org/10.1016/j.invent.2017.03.004

Kvalsvig, A. (2018). *Wellbeing and mental distress in Aotearoa New Zealand: Snapshot 2016*. Health Promotion Agency.

Laamarti, F., Eid, M., & el Saddik, A. (2014). An overview of serious games. *International Journal of Computer Games Technology*, *2014*. https://doi.org/10.1155/2014/358152

Lansford, J. E., French, D. C., & Gauvain, M. (2021). *Child and adolescent development in cultural context*. American Psychological Association; https://www.apa.org/pubs/books/child-adolescent-development-cultural-context

Larson, R., & Ham, M. (1993). Stress and "storm and stress" in early adolescence: The relationship of negative events with dysphoric affect. *Developmental Psychology* (Vol. 29, Issue 1). https://doi.org//10.1037/0012-1649.29.1.130

Lau, H. M., Smit, J. H., Fleming, T. M., & Riper, H. (2017). Serious games for mental health: Are they accessible, feasible, and effective? A systematic review and meta-analysis. In *Frontiers in Psychiatry* (Vol. 7, Issue JAN). Frontiers Media S.A. https://doi.org/10.3389/fpsyt.2016.00209

Le, D., & Mihalopoulos, C. (2021). Putting a dollar value on eating disorders: What is next?. *International Journal of Eating Disorders*, *54*(5), 869–871. https://doi.org/10.1002/EAT.23507

Lee, J. H., Nam, S. K., Kim, A. R., Kim, B., Lee, M. Y., & Lee, S. M. (2013). Resilience: A meta-analytic approach. *Journal of Counseling & Development*, *91*(3), 269–279. https://doi.org/10.1002/J.1556-6676.2013.00095.X

Leech, T., Dorstyn, D., Taylor, A., & Li, W. (2021). Mental health apps for adolescents and young adults: A systematic review of randomised controlled trials. *Children and Youth Services Review*, *127*, 106073. https://doi.org/10.1016

Littlejohns, P., Chalkidou, K., Culyer, A. J., Weale, A., Rid, A., Kieslich, K., Coultas, C., Max, C., Manthorpe, J., Rumbold, B., Charlton, V., Roberts, H., Faden, R., Wilson, J., Krubiner, C., Mitchell, P., Wester, G., Whitty, J. A., & Knight, S. (2019). National Institute for Health and Care Excellence (NICE), social values and healthcare priority setting. In *Journal of the Royal Society of Medicine* (Vol. 112, Issue 5, pp. 173–179). SAGE Publications Ltd. https://doi.org/10.1177/0141076819842846

Locher, C., Meier, S., & Gaab, J. (2019). Psychotherapy: A world of meanings. *Frontiers in Psychology*, *10*(MAR). https://doi.org/10.3389/fpsyg.2019.00460

Lopez, C., Alcalde, B., Martin, F., & Uribe, G. (1997). Critical evaluation of the use of antidepressants in adolescence - PubMed. *Actas Luso Esp Neurol Psiquiatr Cienc Afines*, *25*(4), 251–270. https://pubmed.ncbi.nlm.nih.gov/9412164/

Lucassen, M. F. G., Stasiak, K., Crengle, S., Weisz, J. R., Frampton, C. M. A., Bearman, S. K., Ugueto, A. M., Herren, J., Cribb-Su'a, A., Faleafa, M., Kingi-'Ulu'ave, D., Loy, J., Scott, R. M., Hartdegen, M., & Merry, S. N. (2015). Modular approach to therapy for anxiety, depression, trauma, or conduct problems in outpatient child and adolescent mental health services in New Zealand: Study protocol for a randomized controlled trial. *Trials*, *16*(1). https://doi.org/10.1186/s13063-015-0982-9

Madjar, N., & Chohat, R. (2016). Will I succeed in middle school? A longitudinal analysis of self-efficacy in school transitions in relation to goal structures and engagement. *Http://Dx.Doi.Org/10.1080/01443410.2016.1179265*, *37*(6), 680–694. https://doi.org/10.1080/01443410.2016.1179265

Mahood, Q., van Eerd, D., & Irvin, E. (2014). Searching for grey literature for systematic reviews: challenges and benefits. *Research Synthesis Methods*, *5*(3), 221–234. https://doi.org/10.1002/JRSM.1106

Mallett, R., Hagen-Zanker, J., Slater, R., & Duvendack, M. (2012). The benefits and challenges of using systematic reviews in international development research. *4*(3), 445–455. https://doi.org/10.1080/19439342.2012.711342

Mani, M., Kavanagh, D. J., Hides, L., & Stoyanov, S. R. (2015). Review and evaluation of mindfulness-based iPhone apps. In *JMIR mHealth and uHealth 3*(3). JMIR Publications Inc. https://doi.org/10.2196/mhealth.4328

Markowitz, S., & Cuellar, A. (2007). Antidepressants and youth: Healing or harmful? *Social Science & Medicine (1982)*, *64*(10), 2138. https://doi.org/10.1016

Marshall, J. M., Dunstan, D. A., & Bartik, W. (2019). The digital psychiatrist: In search of evidence-based apps for anxiety and depression. *Frontiers in Psychiatry* (Vol. 10). Frontiers Media S.A. https://doi.org/10.3389/fpsyt.2019.00831

Mathyssek, C. M., Olino, T. M., Hartman, C. A., Ormel, J., Verhulst, F. C., & van Oort, F. V. A. (2013). Does the Revised Child Anxiety and Depression Scale (RCADS) measure anxiety symptoms consistently across adolescence? The TRAILS study. *International Journal of Methods in Psychiatric Research*, *22*(1), 27. https://doi.org/10.1002/MPR.1380

Matika, C. M., Manuela, S., Houkamau, C. A., & Sibley, C. G. (2021). Māori and Pasifika language, identity, and wellbeing in Aotearoa New Zealand. *Kotuitui*, *16*(2), 396–418. https://doi.org/10.1080/1177083X.2021.1900298

McInroy, L. B. (2016). Pitfalls, potentials, and ethics of online survey research: LGBTQ and other marginalized and hard-to-access youths. *Social Work Research*, *40*(2), 83–94. https://doi.org/10.1093/SWR/SVW005

Mental Health Promotion. (2002). Retrieved December 22, 2021, from http://www.europa.eu.int/comm/health/ph_projects/2002/promotion/fp_promotion_2002

Menting, A. T. A., Orobio de Castro, B., & Matthys, W. (2013). Effectiveness of the incredible years parent training to modify disruptive and prosocial child behavior: a meta-analytic review. *Clinical Psychology Review*, *33*(8), 901–913. https://doi.org/10.1016/J.CPR.2013.07.006

Merry, S., Mcdowell, H., Wild, C. J., Bir, J., & Cunliffe, R. (2004). A randomized placebo-controlled trial of a school-based depression prevention program. *J. Am. Acad. Child Adolesc. Psychiatry*, *43*(5), 538–547. https://doi.org/10.1097/01.chi.0000117063.63530.68

Merry, S. N., Cargo, T., Christie, G., Donkin, L., Hetrick, S., Fleming, T., Holt-Quick, C., Hopkins, S., Stasiak, K., & Warren, J. (2020). Debate: Supporting the mental health of school students in the COVID-19 pandemic in New Zealand – a digital ecosystem approach. *Child and Adolescent Mental Health*, *25*(4), 267. https://doi.org/10.1111/CAMH.12429

Merry, S., Stasiak, K., Shepherd, M., Frampton, C., Fleming, T., & Lucassen, M., (2012). The effectiveness of *SPARX*, a computerised self help intervention for adolescents seeking help for depression: Randomised controlled non-inferiority trial. *BMJ (Online)*, *344*(7857). https://doi.org/10.1136/bmj.e2598

Mertens, D. M. (2010). Transformative mixed methods research. *Mixed Methods 16*(6), 469–474. https://doi.org/10.1177/1077800410364612

Mills, K. L., Lalonde, F., Clasen, L. S., Giedd, J. N., & Blakemore, S. J. (2014). Developmental changes in the structure of the social brain in late childhood and adolescence. *Social Cognitive and Affective Neuroscience*, *9*(1), 123–131. https://doi.org/10.1093/scan/nss113

Ministry of Education. (2017). *Pathways and transitions – Education in New Zealand*. https://www.education.govt.nz/communities-of-learning/transitions/

Moewaka Barnes, H., & McCreanor, T. (2019). Colonisation, hauora and whenua in Aotearoa. *Https://Doi.Org/10.1080/03036758.2019.1668439*, *49*(sup1), 19–33. https://doi.org/10.1080/03036758.2019.1668439

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H. L., Houts, R., Poulton, R., Roberts, B. W., Ross, S., Sears, M. R., Thomson, W. M., & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public

safety. *Proceedings of the National Academy of Sciences of the United States of America*, *108*(7), 2693–2698. https://doi.org/10.1073/pnas.1010076108

Moghanloo, V. A., Moghanloo, R. A., & Moazezi, M. (2015). Effectiveness of acceptance and commitment therapy for depression, psychological well-being and feeling of guilt in 7-15 years old diabetic children. *Iranian Journal of Pediatrics*, *25*(4). https://doi.org/10.5812/ijp.2436

Mojtabai, R., Olfson, M., Sampson, N. A., Jin, R., Druss, B., Wang, P. S., Wells, K. B., Pincus, H. A., & Kessler, R. C. (2011). Barriers to mental health treatment: Results from the national comorbidity survey replication. *Psychological Medicine*, *41*(8), 1751–1761. https://doi.org/10.1017/S0033291710002291

Morin, L., Grégoire, S., & Lachance, L. (2020). Processes of change within acceptance and commitment therapy for university students: Preliminary evidence from a randomized controlled trial. *Https://Doi.Org/10.1080/07448481.2019.1705828*, *69*(6), 592–601. https://doi.org/10.1080/07448481.2019.1705828

Nakamura, J., & Csikszentmihalyi, M. (2009). Flow theory and research. *The Oxford Handbook of Positive Psychology, (2 Ed.)*. https://doi.org/10.1093

Neufeld, S. A. S., Jones, P. B., & Goodyer, I. M. (2017). Child and adolescent mental health services: longitudinal data sheds light on current policy for psychological interventions in the community. *Journal of Public Mental Health*, *16*(3), 96–99. https://doi.org/10.1108/JPMH-03-2017-0013

Nugent, N. R., Tyrka, A. R., Carpenter, L. L., & Price, L. H. (2011). Gene-environment interactions: Early life stress and risk for depressive and anxiety disorders. *Psychopharmacology*, *214*(1), 175–196. https://doi.org/10.1007/S00213-010-2151-X

Núñez Díaz, C. (2020). *Students' mental health: The importance of the teacher's role and training*. https://doi.org/10.35811/rea.v10i2.125

Nyongesa, M. K., Ssewanyana, D., Mutua, A. M., Chongwo, E., Scerif, G., Newton, C. R. J. C., & Abubakar, A. (2019). Assessing executive function in adolescence: A scoping review of existing measures and their psychometric robustness. *Frontiers in Psychology*, *10*(MAR), 311. https://doi.org/10.3389/FPSYG.2019.00311/BIBTEX

Ministry of Education, (2010). *Ministry of Education Annual Report 2010 Te Tahuhu o Te Matauranga*. www.minedu.govt.nz

O'Loughlin, K., Neary, M., Adkins, E. C., & Schueller, S. M. (2019). Reviewing the data security and privacy policies of mobile apps for depression. *Internet Interventions*, *15*, 110–115. https://doi.org/10.1016/J.INVENT.2018.12.001

Overbeek, G., van Aar, J., de Castro, B. O., Matthys, W., Weeland, J., Chhangur, R. R., & Leijten, P. (2021). Longer-term outcomes of the incredible years parenting intervention. *Prevention Science*, *22*(4), 419–431. https://doi.org/10.1007/S11121-020-01176-6

Panhwar, A. H., Ansari, S., & Shah, A. A. (2017). Post-positivism: An effective paradigm for social and educational research. *International Research Journal of Arts & Humanities (IRJAH)*, *45*(45). https://sujo-old.usindh.edu.pk/index.php/IRJAH/article/view/3371

Peiris-John, R., Farrant, B., Fleming, T., Bavin, L. , Archer, D., Crengle, S., & Clark, T. (2020). Youth19 Rangatahi smart survey, initial findings: Access to health services. www.youth19.ac.nz

Pew Research. (2017). *Demographics of Mobile device ownership and adoption in the united states | Pew Research Center*. https://www.pewresearch.org/internet/fact-sheet/mobile/

Phillips, D. C., & Burbules, N. C. (2001). Postpositivism and educational research. *British Journal of Educational Studies*, *49*(1). https://philpapers.org/rec/PHIPAE-4

Piñeiro-Cossio, J., Fernández-Martínez, A., Nuviala, A., & Pérez-Ordás, R. (2021). Psychological wellbeing in physical education and school sports: A systematic review. *International Journal of Environmental Research and Public Health* (Vol. 18, Issue 3, pp. 1–16). MDPI AG. https://doi.org/10.3390/ijerph18030864

Poduska, J. M., Kellam, S. G., Wang, W., Brown, C. H., Ialongo, N. S., & Toyinbo, P. (2008). Impact of the good behavior game, a universal classroom–based behavior intervention, on young adult service use for problems with emotions, behavior, or drugs or alcohol. *Drug and Alcohol Dependence*, *95*(Suppl 1), S29. https://doi.org/10.1016/J.DRUGALCDEP.2007.10.009

Poutasi, K. (2004). *Ethnicity data protocols for the health and disability sector. Wellington: Ministry of Health*. http://www.moh.govt.nz

Prins, M. A., Verhaak, P. F. M., Bensing, J. M., & van der Meer, K. (2008). Health beliefs and perceived need for mental health care of anxiety and depression-The patients' perspective explored. In *Clinical Psychology Review* (Vol. 28, Issue 6, pp. 1038–1058). https://doi.org/10.1016/j.cpr.2008.02.009

Przybylko, G., Morton, D. P., & Renfrew, M. E. (2021). Addressing the COVID-19 mental health crisis: A perspective on using interdisciplinary universal interventions. *Frontiers in Psychology*, *12*, 1102. https://doi.org/10.3389/FPSYG.2021.644337/BIBTEX

Purcell, R., Gwyther, K., & Rice, S. M. (2019). Mental health in elite athletes: Increased awareness requires an early intervention framework to respond to athlete needs. *Sports Medicine - Open*, *5*(1), 1–8. https://doi.org/10.1186/S40798-019-0220

Purtle, J., Nelson, K. L., Counts, N. Z., & Yudell, M. (2019). Population-based approaches to mental health: History, strategies, and evidence. *Annual Review of Public Health*, *41*, 201–221. https://doi.org/10.1146/ANNUREV-PUBLHEALTH-040119-094247

Racine, N., McArthur, A., Cooke, E., Eirich, R., Zhu, J., & Madigan, S. (2021). Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19: A Meta-analysis. *JAMA Pediatrics*, *175*(11), 1142–1150. https://doi.org/10.1001/JAMAPEDIATRICS.2021.2482

Reid, C., Kauer, D., Hearps, C., Crooke, D., Khor, S., Sanci, A., & Patton, C. (2013). A mobile phone application for the assessment and management of youth mental health problems in primary care: Health service outcomes from a randomised controlled trial of mobiletype. *BMC Family Practice*, *14*. https://doi.org/10.1186/1471-2296-14-84

Reinecke, L. (2009). Games at work: The recreational use of computer games during working hours. *Cyberpsychology and Behavior*, *12*(4), 461–465. https://doi.org/10.1089/CPB.2009.0010

Rickwood, J., Deane, P., & Wilson,. J. (2007). When and how do young people seek professional help for mental health problems? *Medical Journal of Australia*, *187*(S7), S35–S39. https://doi.org/10.5694/J.1326-5377.2007.TB01334.X

Roberts, G., Grimes, K., (2011)., *Return on investment: Mental health promotion and mental illness prevention*.

Rohleder, N. (2019). Stress and inflammation: The need to address the gap in the transition between acute and chronic stress effects. In *Psychoneuroendocrinology* (Vol. 105, pp. 164–171). Elsevier Ltd. https://doi.org/10.1016/j.psyneuen.2019.02.021

Rosário, P., Högemann, J., Núñez, C., Vallejo, G., Cunha, J., Rodríguez, C., & Fuentes, S. (2019). The impact of three types of writing intervention on students' writing quality. *PLOS ONE*, *14*(7), e0218099. https://doi.org/10.1371/JOURNAL.PONE.0218099

Ruini, C., Ottolini, F., Tomba, E., Belaise, C., Albieri, E., Visani, D., Offidani, E., Caffo, E., & Fava, G. A. (2009). School intervention for promoting psychological well-being in adolescence. *Journal of Behavior Therapy and Experimental Psychiatry*, *40*(4), 522–532. https://doi.org/10.1016/J.JBTEP.2009.07.002

Rupp, A., Sweetman, R., Sosa, E., Smither, J. A., & McConnell, D. S. (2017). Searching for affective and cognitive restoration: Examining the restorative effects of casual video game play. *Human Factors*, *59*(7), 1096–1107. https://doi.org/10.1177/0018720817715360

Russoniello, C., Fish, M., & O'Brien, K. (2013). The efficacy of casual videogame play in reducing clinical depression: A randomized controlled study. *Games for Health Journal*, *2*(6), 341–346. https://doi.org/10.1089/g4h.2013.0010

Russoniello, C., Fish, M. T., & O'brien, K. (2019). The efficacy of playing videogames compared with antidepressants in reducing treatment-resistant symptoms of depression. *Games for Health Journal*, 8(5), 332–338. https://doi.org/10.1089/g4h.2019.0032

Ryan, A. B. (2006). *Post-positivist approaches to research*.

Ryan, R. M., & Deci, E. L. (2000). *On happiness and human potentials: A review of research on hedonic and eudaimonic well-being*. www.annualreviews.org

Ryff, C. D. (1995). Psychological well-being in adult life. *Psychological Science* (Vol. 4, Issue 4).

Sawyer, S. M., Azzopardi, P. S., Wickremarathne, D., & Patton, G. C. (2018). The age of adolescence. *The Lancet Child and Adolescent Health*, 2(3), 223–228. https://doi.org/10.1016/S2352-4642(18)30022-1

Scheid, T. L., & Brown, T. N. (2010). *A handbook for the study of mental health : social contexts, theories, and systems*. 714. https://books.google.com/books/about/A_Handbook_for_the_Study_of_Mental_Healt.html?id=IxQDvOodXeAC

Schønning, V., Hjetland, G. J., Aarø, L. E., & Skogen, J. C. (2020). Social media use and mental health and well-being among adolescents – A scoping review. *Frontiers in Psychology* (Vol. 11). Frontiers Media S.A. https://doi.org/10.3389/fpsyg.2020.01949

Shafer, D. M., & Carbonara, C. P. (2015). Examining enjoyment of casual videogames. *Games for Health Journal*, 4(6), 452–459. https://doi.org/10.1089/g4h.2015.0012

Shepherd, M., Fleming, T., Lucassen, M., Stasiak, K., Lambie, I., & Merry, S. N. (2015). The design and relevance of a computerized gamified depression therapy program for indigenous m ori adolescents. *JMIR Serious Games*, 3(1). https://doi.org/10.2196/games.3804

Shepherd, M., Merry, S., Lambie, I., & Thompson, A. (2018). Indigenous adolescents' perception of an e-mental health program (*SPARX*): Exploratory qualitative assessment. *JMIR Serious Games*, 20(7). https://doi.org/10.2196/games.8752

Sheppard, R., Deane, F. P., & Ciarrochi, J. (2018). Unmet need for professional mental health care among adolescents with high psychological distress. *Australian and New Zealand Journal of Psychiatry*, 52(1), 59–67. https://doi.org/10.1177/0004867417707818

Shochet, I. M., Dadds, M. R., Holland, D., Whitefield, K., Harnett, P. H., & Osgarby, S. M. (2001). The efficacy of a universal school-based program to prevent adolescent depression. *Journal of Clinical Child and Adolescent Psychology*, 30(3), 303–315. https://doi.org/10.1207/S15374424JCCP3003_3

Silverstone, P. H., Bercov, M., Suen, V. Y. M., Allen, A., Cribben, I., Goodrick, J., Henry, S., Pryce, C., Langstraat, P., Rittenbach, K., Chakraborty, S., Engles, R. C., & McCabe, C. (2017). Long-term results from the empowering a multimodal pathway toward healthy youth program, a multimodal school-based approach, show marked reductions in suicidality, depression, and anxiety in 6,227 students in grades 6-12 (aged 11-18). *Frontiers in Psychiatry*, *8*(5). https://doi.org/10.3389/fpsyt.2017.00081

Skehan, B., & Davis, M. (2017). Aligning mental health treatments with the developmental stage and needs of late adolescents and young adults. *Child and Adolescent Psychiatric Clinics of North America*, *26*(2), 177–190. https://doi.org/10.1016/J.CHC.2016.12.003

Slade, M. (2010). Mental illness and well-being: The central importance of positive psychology and recovery approaches. *BMC Health Services Research*, *10*. https://doi.org/10.1186/1472-6963-10-26

Spadaro, B., Martin-Key, N. A., & Bahn, S. (2021). Building the digital mental health ecosystem: Opportunities and challenges for mobile health innovators. *Journal of Medical Internet Research*, *23*(10), e27507. https://doi.org/10.2196/27507

Spear, L. P. (2013). Adolescent neurodevelopment. *Journal of Adolescent Health*, *52*(2), S7–S13. https://doi.org/10.1016/J.JADOHEALTH.2012.05.006

Spirito, A., Esposito-Smythers, C., Wolff, J., & Uhl, K. (2011). Cognitive-behavioral therapy for adolescent depression and suicidality. In *Child and Adolescent Psychiatric Clinics of North America* (Vol. 20, Issue 2, pp. 191–204). https://doi.org/10.1016/j.chc.2011.01.012

Stallard, P. (2002). *A clinician's guide to think good-feel good: Using cbt with children* (L. John Wiley & Sons, Ed.). https://books.google.co.nz/books?hl=en&lr=&id=nu0cq3HpsP8C&oi=fnd&pg=PR5&dq=Stallard+(2002)+suggests+clinicians+adapat+CBT&ots=JzpEpAEXmK&sig=4V90rVl0r3Oy4MKiZAcLGJXeV8A#v=onepage&q&f=false

Statista. (2021). *Social media and technology*. https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

Statistics New Zealand. (2018). *Census population and dwelling counts | Stats NZ*. https://www.stats.govt.nz/information-releases/2018-census-population-and-dwelling-counts

Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. *Developmental Review*, *28*(1), 78–106. https://doi.org/10.1016/j.dr.2007.08.002

Steiner, N. J., Frenette, E. C., Rene, K. M., Brennan, R. T., & Perrin, E. C. (2014). In-school neurofeedback training for ADHD: Sustained improvements from a randomized control trial. *Pediatrics*, *133*(3), 483–492. https://doi.org/10.1542/PEDS.2013-2059

Stroud, M. J., & Whitbourne, S. K. (2015). Casual video games as training tools for attentional processes in everyday life. *Cyberpsychology, Behavior, and Social Networking*, *18*(11), 654–660. https://doi.org/10.1089/cyber.2015.0316

Sturrock, F., Gray, D., Hayward, S., & Mcgovern, J. (2013). *Ministry of Social Development Incredible Years Pilot Study*.

Sue, V., & Ritter, L. (2015). Conducting online surveys. *Conducting online surveys*. https://doi.org/10.4135/9781506335186

Tang, Y. Y., Tang, R., & Gross, J. J. (2019). Promoting psychological well-being through an evidence-based mindfulness training program. *Frontiers in Human Neuroscience*, *13*. https://doi.org/10.3389/fnhum.2019.00237

Tanlaka, E. F., Ewashen, C., & King-Shier, K. (2019). Postpositivist critical multiplism: Its value for nursing research. *Nursing Open*, *6*(3), 740–744. https://doi.org/10.1002/NOP2.306

Tashakkori, A., & Creswell, J. W. (n.d.). Editorial: The new era of mixed methods. *Journal of Mixed Methods Research*. https://doi.org/10.1177/2345678906293042

Tashakkori, Abbas., & Teddlie, Charles. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. 185.

Taylor, M. J., Robinson, E. B., Happé, F., Bolton, P., Freeman, D., & Ronald, A. (2015). A longitudinal twin study of the association between childhood autistic traits and psychotic experiences in adolescence. *Molecular Autism*, *6*(1), 1–11. https://doi.org/10.1186/S13229-015-0037-9/FIGURES/2

Te Pou. (2009). *A guide to talking therapies in New Zealand.* Te Pou o te Whakaaro Nui.

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *27*(2), 237–246. https://doi.org/10.1177/1098214005283748

Thompson, T. (2021). Young people's climate anxiety revealed in landmark survey. *Nature*, *597*(7878), 605. https://doi.org/10.1038/D41586-021-02582-8

Torous, J., Myrick, K. J., Rauseo-Ricupero, N., & Firth, J. (2020). Digital mental health and COVID-19: Using technology today to accelerate the curve on access and quality tomorrow. In *JMIR Mental Health* (Vol. 7, Issue 3). JMIR Publications Inc. https://doi.org/10.2196/18848

Torous, J., Nicholas, J., Larsen, M. E., Firth, J., & Christensen, H. (2018). Clinical review of user engagement with mental health smartphone apps: evidence, theory and improvements. *Evidence-Based Mental Health*, *21*(3), 116–119. https://doi.org/10.1136/EB-2018-102891

Torous, J., & Roberts, L. W. (2017). Needed innovation in digital health and smartphone applications for mental health transparency and trust. In *JAMA Psychiatry* (Vol. 74, Issue 5, pp. 437–438). American Medical Association. https://doi.org/10.1001/jamapsychiatry.2017.0262

Travagin, G., Margola, D., & Revenson, T. A. (2015). How effective are expressive writing interventions for adolescents? A meta-analytic review. In *Clinical Psychology Review* (Vol. 36, pp. 42–55). Elsevier Inc. https://doi.org/10.1016/j.cpr.2015.01.003

van Agteren, J., Iasiello, M., Lo, L., Bartholomaeus, J., Kopsaftis, Z., Carey, M., & Kyrios, M. (2021). A systematic review and meta-analysis of psychological interventions to improve mental wellbeing. *Nature Human Behaviour*, *5*(5), 631–652. https://doi.org/10.1038/s41562-021-01093-w

Vaughn, S., Schumm, J. S., & Sinagub, J. (2012). Focus group interviews in education and psychology. *Education and Psychology*. https://doi.org/10.4135/9781452243641

Velasco, A., Cruz, I. S. S., Billings, J., Jimenez, M., & Rowe, S. (2020). What are the barriers, facilitators and interventions targeting help-seeking behaviours for common mental health problems in adolescents? A systematic review. *BMC Psychiatry 2020 20:1*, *20*(1), 1–22. https://doi.org/10.1186/S12888-020-02659-0

Vukic, A., & Gregory, D. (2012). *Indigenous health research: Theoretical and methodological perspectives*. https://www.researchgate.net/publication/263482946

Wang, K., Varma, D. S., & Prosperi, M. (2018). A systematic review of the effectiveness of mobile apps for monitoring and management of mental health symptoms or disorders. *Journal of Psychiatric Research*, *107*, 73–78. https://doi.org/10.1016/J.JPSYCHIRES.2018.10.006

Wang, P. S., Angermeyer, M., Borges, G., Bruffaerts, R., Chiu, W. T., Girolamo, G. De, Fayyad, J., Gureje, O., Haro, J. M., Huang, Y., Kessler, R. C., Kovess, V., Levinson, D., Nakane, Y., Brown, M. A. O., Oremei, J. H., Posada-villa, J., Aguilar-gaxiola, S., Alonso, J., … Üstun, T. B. (2007). Delay and failure in treatment seeking after first onset of mental disorders in the World Health Organization's World Mental Health Survey Initiative. *World Psychiatry*, *6*(3), 177. /pmc/articles/PMC2174579/

Wasil, A. R., Gillespie, S., Schell, T., Lorenzo-Luaces, L., & DeRubeis, R. J. (2021). Estimating the real-world usage of mobile apps for mental health: development and application of two novel metrics. *World Psychiatry* (Vol. 20, Issue 1, pp. 137–138). Blackwell Publishing Ltd. https://doi.org/10.1002/wps.20827

Watkins, P. C., Woodward, K., Stone, T., & Kolts, R. L. (2003). Gratitude and happiness: Development of a measure of gratitude, and relationships with subjective well-being.

Social Behavior and Personality, *31*(5), 431–452.
https://doi.org/10.2224/SBP.2003.31.5.431

Webster-Stratton, C., Reid, M. J., & Hammond, M. (2004). Treating children with early-onset conduct problems: intervention outcomes for parent, child, and teacher training. *Journal of Clinical Child and Adolescent Psychology*, *33*(1), 105–124. https://doi.org/10.1207/S15374424JCCP3301_11

Webster-Stratton, C., Rinaldi, J., & Reid, J. M. (2011). Long-term outcomes of incredible years parenting program: predictors of adolescent adjustment. *Child and Adolescent Mental Health*, *16*(1), 38–46. https://doi.org/10.1111/J.1475-3588.2010.00576.X

Weiss, A., Chambon, V., Lee, J. K., Drugowitsch, J., & Wyart, V. (2021). Interacting with volatile environments stabilizes hidden-state inference and its brain signatures. *Nature Communications*, *12*(1). https://doi.org/10.1038/s41467-021-22396-6

Wenzel, A. (2017). Innovations in cognitive behavioral therapy: Strategic interventions for creative practice. *Innovations in Cognitive Behavioral Therapy: Strategic Interventions for Creative Practice*, 1–213. https://doi.org/10.4324/9781315771021/INNOVATIONS-COGNITIVE-BEHAVIORAL-THERAPY-AMY-WENZEL

Westerhof, G. J., & Keyes, C. L. M. (2010). Mental illness and mental health: The two continua model across the lifespan. *Journal of Adult Development*, *17*(2), 110–119. https://doi.org/10.1007/s10804-009-9082-y

Whitehead, A. L., Sully, B. G. O., & Campbell, M. J. (2014). Pilot and feasibility studies: is there a difference from each other and from a randomised controlled trial? *Contemporary Clinical Trials*, *38*(1), 130–133. https://doi.org/10.1016/J.CCT.2014.04.001

Wies, B., Landers, C., & Ienca, M. (2021). Digital mental health for young people: A scoping review of ethical promises and challenges. *Frontiers in Digital Health*, *0*, 91. https://doi.org/10.3389/FDGTH.2021.697072

Wilson, D. B., Gottfredson, D. C., & Najaka, S. S. (2001). School-based prevention of problem behaviors: A aeta-analysis. *Journal of Quantitatiûe Criminology*, *17*(3).

Wisdom, J., & Creswell, J. (2013). Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centered medical home models. https://pcmh.ahrq.gov/page/mixed-methods-integrating-quantitative-and-qualitative-data-collection-and-analysis-while

World Health Organisation. (2014). *Health for the world's adolescents A second chance in the second decade*. www.who.int/adolescent/second-decade

World Health Organisation. (2017). *Mental health atlas,WHO (2017)*.

Zechmeister, I., Kilian, R., McDaid, D., Dierckx, H., Rissanen, P., Lepine, J. P., Becker, T., Constantoupoulos, A., Tomasson, K., Kenelly, B., Amaddeo, F., Evers, S., Halsteinli, V., Duarte-Oliveira, M., Salvador-Carulla, L., Jonsson, L., Dernovsek, M. Z., Knapp, M., Medeiros, H., … Xerri, R. G. (2008). Is it worth investing in mental health promotion and prevention of mental illness? A systematic review of the evidence from economic evaluations. *BMC Public Health*, *8*. https://doi.org/10.1186/1471-2458-8-20

Zhang, Z., & Chen, W. (2019). A Systematic review of the relationship between physical activity and happiness. In *Journal of Happiness Studies* (Vol. 20, Issue 4, pp. 1305–1322). Springer Netherlands. https://doi.org/10.1007/s10902-018-9976-0

Zucker, R. A., Gonzalez, R., Feldstein Ewing, S. W., Paulus, M. P., Arroyo, J., Fuligni, A., Morris, A. S., Sanchez, M., & Wills, T. (2018). Assessment of culture and environment in the adolescent brain and cognitive development study: Rationale, description of measures, and early data. *Developmental Cognitive Neuroscience*, *32*, 107–120. https://doi.org/10.1016/J.DCN.2018.03.004