The Impact of a Telephone-based Health Coaching Intervention on Anthropometric and Health Risk Behaviour Outcomes for People who have Received Treatment for a Mental Health Disorder

Timothy William Regan

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School of Psychology, The University of Newcastle

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Statement of Originality

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Acknowledgement of Collaboration

I hereby certify that the work embodied in this thesis has been done in collaboration with other researchers. I have included as part of this thesis a statement clearly outlining the extent of collaboration, with whom and under what auspices.

I contributed to the development of the research question, database searches regarding the literature review, obtaining data from the Get Healthy Service, the statistical analysis of data, the interpretation of results, and the writing and editing of the manuscript. Prof Jenny Bowman contributed to the development of the research question, obtaining data from the Get Healthy Service, the interpretation of results, and editing of the manuscript. Prof Chris Rissel and Nageen Ahmed from NSW Office of Preventive Health support the transfer of the data from the Get Healthy Service to the research team. Dr Kate Bartlem, Ms Jacqui Bailey, and Mr Christophe Lecathelinais assisted in obtaining and cleaning the dataset. Dr Paul Rippon assisted in the analysis of the data.

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Abstract

Previous research consistently demonstrates that people with a mental health disorder experience a disproportionate burden of chronic physical disease when compared to people without a mental health disorder. It has been estimated that people with a mental health disorder are up to 5.5 times more likely to die before the age of 65 than people without a mental health disorder, with life expectancy gaps between those with and without a mental health disorder estimated to be as high as 24 years. Several factors are thought to contribute to the burden of physical disease, including complications from medication and socioeconomic stressors. An increased prevalence of health risk behaviours among people with a mental health disorder that are associated with increased likelihood of chronic disease. Compared to the general population, people with a mental health disorder report significantly greater rates of insufficient nutrition, insufficient physical activity, smoking, and alcohol misuse. Previous research has indicated that attempts to improve the provision of preventive health care in these settings have so far had a limited impact. As such, alternative strategies to improve health risk behaviour among this population are needed. Telephone-based coaching services, such as the Get Health Information and Coaching Service (GHS), have been identified as possible alternatives to deliver preventive care for people with a mental health disorder. However, to date, no evaluation of the GHS has been undertaken for people with a mental health disorder. The aim of this thesis is to determine the impact of the GHS for users who reported previously receiving treatment for a mental health issue.

Methods

A pre-post evaluation design was used to determine within and between group differences on anthropometric and health risk behaviour outcomes for people who have previously received treatment for a mental health disorder and people who have not previously received treatment for a mental health disorder. Included data was routinely collected by the GHS as part of their

Coaching Program. Data was collected at baseline, midpoint (three month follow-up) and graduation (six month follow-up). Only baseline and graduation data were included in this study. Categorisation as having a mental health disorder has assessed based on a yes/no response to the question *"Have you had significant mental health problems that required treatment from a health professional?"*. Primary outcomes were anthropometric measures (weight, Body Mass Index [BMI], waist circumference) and health risk behaviour outcomes (nutrition, physical activity).

Results

The study sample included 3304 participants who enrolled in the GHS Coaching Program between 1st January 2015 and 30th June 2016. During this period, 43.6% withdrew or were terminated from the coaching program, 44.2% had not yet completed the coaching program (considered 'active'), and 12.2% had completed the program. Approximately 25% of all participants indicated they had received treatment for a mental health issue in the past. Within the study sample, participants with a mental health disorder (MHD) were heavier at baseline, had a greater waist circumference and reported greater health risk behaviours (nutrition, physical activity). Among coaching program completers, people with a MHD reported improvements in weight, nutrition, and physical activity. People without a MHD reported improvements in weight, waist circumference, nutrition and physical activity. People without a MHD reported greater improvements in weight (and waist circumference) than people with a MHD. Changes in classification of risk for anthropometric outcomes and health behaviours were assessed from baseline to graduation, with no interactions between time and group observed.

Implications

This study demonstrates that a large proportion of GHS clients reported previously receiving treatment for a mental health issue. Clients with a Mental Health Disorder (MHD) reported

greater anthropometric risks and health behaviour risks at baseline than non-MHD clients. This study demonstrates that the GHS can help to support improvements in weight, nutrition, and physical activity for people with a MHD. Although it is likely that participants would experience some reduction in chronic disease health risk because of the GHS coaching program, the effects of the program were small to moderate at best. The results of this study are somewhat consistent with the few previous studies exploring the impact of telephone-based coaching interventions for people with a mental health disorder. Limitations include a lack specificity regarding how people were categorised as having a mental health disorder, the high levels of dropout among the study sample, and the reliance on self-report data. Future studies involving the GHS should look to improve data collection methods around mental health variables, explore process variables such as number and length of calls, service satisfaction, and examine ways to optimise the service to meet the needs of people with a mental health disorder.

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Critical Literature Review

This literature review outlines the current research regarding the international and Australian prevalence rates of mental health disorders, the prevalence and burden of chronic disease among people with a mental health disorder, and the prevalence of behaviours that increase the risk of developing chronic disease. This review then explores the available literature regarding individual- and population-level approaches to improving the chronic disease-risk behaviours of people with a mental health disorder. This review will explore the role telephone-based behaviour change interventions in supporting people with a mental health disorder to improve chronic disease risk behaviours.

The term 'mental health disorder' follow the definition provided by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013), which defines a mental health disorder as:

> A syndrome characterised by clinically significant disturbance in an individual's cognition, emotion regulation, or behaviour that reflects a dysfunction in the psychological, biological, or developmental processes underlying mental functioning. Mental disorders are usually associated with significant distress or disability in social, occupational, or other important activities. (p. 20)

Prevalence and Burden of Mental Health Disorders

International prevalence of people with a mental health disorder.

Internationally, the prevalence of mental health disorders has been estimated via the World Health Organisation's (WHO) World Mental Health Survey (Kessler et al., 2009). Life time prevalence rates of any mental health disorder ranged from 12% (Nigeria) to 47.4% (United States). Anxiety and mood disorders were the most commonly reported mental health disorders, with lifetime prevalence rates of 14.3% and 10.6% respectively, and 12-month prevalence rates of 0.8% and 6.8% respectively. More severe mental health disorders, such as

schizophrenia and bipolar disorder, had 12-month prevalence rates ranging from 0.8%to 6.8% (Kessler et al., 2009).

In terms of the impact of a mental health disorder on physical health and mortality, mental health disorders have been estimated to be the leading contributor to non-fatal disease burden, accounting for 22.9% of all Years Lived with Disabilities (YLDs) and 7.4% of total Disability Adjusted Life Years (DALYs) lost (Hjorthøj, Stürup, McGrath, & Nordentoft, 2017; Kessler et al., 2009). International rates of all-cause mortality among people with a mental health disorder have been estimated to be between 1.3 and 4.3 times greater than the general population (Druss, Zhao, Von Esenwein, Morrato, & Marcus, 2011; Walker, McGee, & Druss, 2015). Moreover, the difference in life expectancy between those with and without a mental health disorder has been estimated to range from 10 to 24 years (Chang et al., 2011; Correll et al., 2017). More severe mental health disorders have been found to associated with greater reductions in life expectancy than less severe disorders (Chang et al., 2011).

Australian prevalence of people with a mental health disorder.

In Australia, the Australian Bureau of Statistics undertook a nationwide survey of residents aged 18 to 85 using a similar methodology to the WHO's World Mental Health Survey in 2007 (Slade, Johnston, Oakley Browne, Andrews, & Whiteford, 2009). Respondents reported lifetime prevalence rates of any mental health disorder of 45.5% and 12 month prevalence rates of 20% (Slade et al., 2009). Similar to data collected by the WHO, anxiety disorders and mood disorders were the most common disorders in the preceding 12 months (14.4% & 6.2% respectively). For more severe mental health disorders, 12 month prevalence rates were 2.5% (Slade et al., 2009).

The burden of mental health disorders and associated mortality in Australia were similar to that reported internationally: 24.2% of YLDs and 13.3% of DALYs were attributable to mental health disorders (Begg, Vos, Barker, Stanley, & Lopez, 2008). Rates of

all-cause mortality among adults aged 18 to 64 were 5.5 times higher among people with a severe mental health disorder than those without a mental health disorder (Saha, Whiteford, & McGrath, 2014). Life expectancy gaps were similar to those cited in international studies, with averages of 15.9 (males) and 12 (females) years less for people with a mental health disorder compared to the general population, with illness severity associated with further reduced life expectancy (Lawrence, Hancock, & Kisely, 2013).

Chronic Physical Disease among People with Mental Health Disorders

Despite increased rates of death by suicide and homicide among people with a mental health disorder compared to people without a mental health disorder (Crump, Sundquist, Winkleby, & Sundquist, 2013; Liu et al., 2017; Nordentoft et al., 2013), previous research has consistently shown that significantly more deaths within this population are associated with preventable chronic physical disease (Lawrence et al., 2013; Nordentoft et al., 2013).

International burden of chronic disease for people with a mental health disorder.

Several international studies demonstrate that rates of chronic physical disease, such as cardiovascular disease (Correll et al., 2017), cancer (Chou, Wang, Lin, & Kao, 2017), diabetes (Vancampfort et al., 2016), and respiratory diseases (Partti et al., 2015), are consistently greater among people with a mental health disorder compared to the general population. In turn, rates of mortality related to chronic disease are notably higher compared to the general population. For example, in the United Kingdom, cardiovascular disease-related mortality has been estimated to be 2.6 times greater than the general population, with respiratory disease-related mortality estimated to be 4.9 times greater than the general population (Brown, Kim, Mitchell, & Inskip, 2010). Similar cardiovascular disease related mortality rates have been reported in the United States (Callaghan et al., 2014; Ringen, Engh, Birkenaes, Dieset, & Andreassen, 2014), Sweden (Westman et al., 2017), Denmark and Finland (Laursen et al., 2013), and Taiwan (Tsai et al., 2017).

Australian burden of chronic disease for people with a mental health disorder.

Data collected from population-based registries of patients attending mental health services suggest the proportion of deaths attributable to cardiovascular disease among Australians has been estimated to be approximately 26% for males and 35% for females (Bartlem et al., 2015). The proportion of deaths attributable to cancers is approximately 13% for both males and females. A similar population-based registry study found that patients attending mental health services had significantly greater risk of diabetes-related hospitalisation and diabetes-related mortality (Mai, Holman, Sanfilippo, Emery, & Preen, 2011).

Prevalence of Chronic Disease Risk Behaviours among People with Mental Health Disorders

Although a number of factors have been identified as underlying the increased prevalence chronic physical diseases among people with a mental health disorder, including medication complications (Correll, Detraux, De Lepeleire, & De Hert, 2015; Darbà et al., 2013) and socioeconomic stressors (Collins, Tranter, & Irvine, 2012), it is the increased prevalence of chronic disease risk behaviours among this population are of most interest, given their relationship with chronic disease and the opportunity to intervene more directly with these behaviours (Bartlem, Bowman, Bailey, et al., 2015; Scott & Happell, 2011). Chronic disease risk behaviours can be defined as behaviours that affect ones health and/or are associated with increased risk of developing chronic disease (Lim et al., 2012). These behaviours include poor diet and physical inactivity, smoking, and alcohol misuse, which collectively account for almost 20% of the global burden of disease burden (Lim et al., 2012). Both internationally and in Australia the prevalence of each these behaviours is greater among people with a mental health disorder than the general population (Bartlem, Bowman, Bailey, et al., 2015; Scott & Happell, 2011).

Smoking.

International studies have estimated the prevalence of tobacco smoking among people with a mental health disorder to be notably higher than the general population (Lawrence, Mitrou, & Zubrick, 2009; Prochaska, Das, & Young-Wolff, 2017). For example, estimates from the National Survey on Drug Use and Health undertaken in the USA suggest the prevalence of smoking among people with a mental health disorder is 36.5%, compared to 25.5% within the general population (Substance Abuse and Mental Health Services Administration, 2013). In the United Kingdom, population-based surveys indicated that 40.5% of people with a mental health disorder were current smokers, compared to 16.5% of the general population (Public Health England, 2016). In Australia, the prevalence of smoking among people with a mental health disorder has been estimated to range from 36% and 67% (Bartlem, Bowman, Bailey, et al., 2015; Cooper et al., 2012; Lawrence et al., 2009), compared to 13% among the general population (Australian Bureau of Statistics, 2017). Among people accessing community mental health services, the prevalence of current smoking has been estimated at 50.7%. Separate studies suggested a greater prevalence of current smoking among people with a psychotic disorder (67%; Cooper et al., 2012) than anxiety or substance-use disorders (37%; Lawrence et al., 2009).

Alcohol.

Data regarding the prevalence of harmful alcohol use among people with a mental health disorder is limited. A study of 282 mental health service undertaken in the UK indicated that 25% met criteria for harmful alcohol use (AUDIT scores ≥ 8 (Weaver et al., 2003). In the USA, a survey study with people with a mental health disorder accessing Veterans Affairs services indicated that between 21%-25% of respondents met criteria for harmful short-term alcohol use based a single-item screening question (Kilbourne et al., 2009). Among clients of US mental health services, 17% met criteria for alcohol dependence, compared to 7% in the

general US population (Cook et al., 2015). In Australia, 17.4% of the general population reporting exceeding the lifetime risk guidelines for alcohol consumption of more than two standard drinks per day (Australian Bureau of Statistics, 2017). The prevalence of single-occasion risky drinking (i.e., more than four standard drinks in a single occasion) ranged from 46% among people aged 18-24 to less than 10% among people aged 70 years and over (Australian Institute of Health and Welfare, 2017). Among a sample of clients attending community mental health services, 40.3% were at risk of single occasion harm and 35.3% were at risk of long-term harm (Bartlem, Bowman, Bailey, et al., 2015).

Nutrition.

A systematic review of 31 studies of the diets of people with schizophrenia have indicated that they are typically lower in fruit and fibre and higher in saturated fats when compared to the diets reported by people without schizophrenia (Dipasquale et al., 2013). Moreover, Studies undertaken in Iran, the UK and Spain indicate that people with schizophrenia are often at risk for inadequate fruit and vegetable intake (Amani, 2007; Simonelli-Muñoz et al., 2012; Smith et al., 2007). In Australia, there is limited research regarding the dietary habits of people with mental health disorders. A study of 1286 people with a psychotic disorder indicated that nearly 75% of the sample met WHO criteria for inadequate fruit and vegetable intake (Hahn et al., 2014), whereas 60% of community mental health service clients did not meet Australia's National Health and Medical Research Centre (NHMRC) guidelines for fruit and vegetable intake (2 fruit serves & 5 vegetable serves; Bartlem, Bowman, Bailey, et al., 2015).

Physical Activity.

Studies undertaken in the USA suggest that people with a mental health disorder are marginally less likely to meet national physical activity guidelines compared to people with a mental health disorder. For example, among a large sample of Veteran's Affairs clients (N =

147,193), up to 58% of clients (depending on diagnosis) with mental health disorder reported not meeting recommended levels of physical activity, compared to 39% of clients without a mental health disorder (Kilbourne et al., 2009) and 50.6% of the general US population (National Center for Health Statistics, 2015). Smaller studies undertaken in Denmark (Nyboe & Lund, 2013) and the UK (Ussher, Stanbury, Cheeseman, & Faulkner, 2007) also indicate that people living with a mental health disorder are less likely to meet physical activity guidelines than people without a mental health disorder. In Australia, it has been estimated that the prevalence of people with a mental health disorder not meeting physical guidelines (more than 150 minutes moderate, or 75 minutes vigorous physical activity, per week) is 71.1% among clients of community mental health services (Bartlem, Bowman, Bailey, et al., 2015) and as high as 97% among people living with a chronic psychotic disorder (Hahn et al., 2014). In contrast, approximately 45% of the general population do not meet physical activity guidelines (Australian Bureau of Statistics, 2017).

The research regarding the prevalence of health risk behaviours among people with a mental health disorder highlights a pattern of inequity in comparison to the general population. Addressing the disproportionate burden of chronic physical disease risk factors experienced by people with a mental illness is crucial to improving the physical health of this population.

Who Supports Chronic Disease Risk Behaviour Change among People with Mental Health Disorders?

Addressing the disproportionate burden chronic disease behaviour among people with a mental health disorder has been identified as a health priority by the World Health Organisation (World Health Organization, 2002) and the Australian government (Australian Institute of Health and Welfare, 2016; Willcox, 2014). In order to address this burden in Australia, both the Australian Health Policy Collaboration and the Australian National

Preventive Health Agency have recognised that health is determined by biological, psychological and social factors (Australian National Preventive Health Agency, 2013; Willcox, 2014). As a result, both organisations support the delivery of a multifaceted approach to improving chronic disease risk factors. Similarly, the Australian Psychological Society and the Royal Australian and New Zealand College of Psychiatrists have acknowledged the need for individual-level and public health interventions to support improvements in the physical health of people with a mental illness (Australian Psychological Society, 2008; Royal Australian & New Zealand College of Psychiatrists, 2017). Recently, the New South Wales state government released updated practice guidelines outlining the minimum expectations for the physical health care of people with a mental health disorder. These expectations included increasing empowerment of consumers to participate in their physical health care, and enhancing linkages between consumers and health care services that deliver appropriate physical health care (NSW Government, 2017). Research has highlighted there are notable inadequacies in the delivery of preventive care within services that work closely with people with a mental health disorder, including community mental health services and general practitioners.

Community mental health services.

The delivery of preventive care by health care services is recommended to follow the AAR framework (Fiore, Jaen, & Baker, 2008; Revell & Schroeder, 2005): **Assess** patient for risk, **Advise** patient of risk and the benefits of reducing risk, **Refer** patient to a service provider for additional support to improve risk. However, the delivery of preventive care within this framework is suboptimal in specialist mental health services (Anderson et al., 2013; Wye et al., 2009). The reasons for suboptimal preventive care are not clear, but some potential barriers have been suggested, including clinician perceptions that mental health consumers do not want to discuss or change health risk behaviour and a lack of clinician confidence in

making appropriate referrals (Bartlem, Bowman, Freund, et al., 2015; Happell, Scott, & Platania-Phung, 2012). This is despite previous research indicating that the AAR framework is an acceptable preventive care strategy for clinicians and consumers (Bartlem, Bowman, Freund, et al., 2015; Bartlem et al., 2016; Young, Praskova, Hayward, & Patterson, 2017), and that people with a mental health disorder have a similar level of desire and capacity to change chronic disease risk behaviour as people with a mental health disorder (Ashton, Rigby, & Galletly, 2013; Stockings et al., 2012).

General practitioners.

Previous research has shown that delivery of preventive care to reduce health risk behaviour by General Practitioners (GPs) is suboptimal for people with a mental health disorder (Lawrence & Kisely, 2010). For example, in the UK people with a mental health disorder are less likely to receive smoking cessation support compared to people without a mental health disorder (Szatkowski & McNeill, 2013). In Australia, previous research has shown that that delivery of advice regarding physical activity for people with a mental health disorder is uncommon in primary care settings (Happell et al., 2015). Research has shown that similar to staff in specialist mental health services, a lack of GP confidence providing care for people with a mental illness (Fleury, Bamvita, & Tremblay, 2009), and GPs holding inaccurate perceptions regarding the desires and motivations for behaviour change among this population is likely to drive suboptimal delivery of preventive care (Jackson & Kay, 2013).

The research to-date suggests that the delivery of preventive care to people with a mental health disorder is suboptimal, due in large part to the attitudes of staff towards the provision of preventive care to this population, and the practical barriers to providing effective preventive care in these settings. Given the desire of people with a mental health disorder to improve their health, the desire of frontline healthcare providers to support people with a mental health disorder to make these changes, and desire of policy-makers to reduce

the disproportionate burden of chronic disease among people with a mental health disorder, engaging, cost-effective, population-level interventions is needed. Utilising existing telephone-based specialist health risk behaviour change services could provide more appropriate preventive care for people with a mental health disorder to improve health behaviours and improve health risks.

Are Telephone-Based Specialist Health Risk Behaviour Change Services Effective?

Specialist health risk behaviour change services, such as Quitline and the Get Healthy Information and Coaching Service (GHS), are typically free services available to all parts of the population. There is systematic review evidence that telephone-based coaching services can improve physical activity and nutrition (Goode, Reeves, & Eakin, 2012), smoking (Stead, Perera, & Lancaster, 2007), and alcohol misuse (Gates & Albertella, 2016) within the general population. Goode and colleagues identified and reviewed 25 studies (16 targeting physical activity, two targeting nutrition, seven combined physical activity and nutrition) that included a controlled comparison group, or were a pre-post dissemination study (where a previous controlled trial had demonstrated intervention efficacy). They reported that improvements in physical activity in 14 of 17 studies, improvements in nutrition in two of two studies, and improvements in physical activity and nutrition in four of seven combined interventions.

Stead and colleagues identified and reviewed 14 randomised- and quasi-randomised controlled trials of telephone quitlines that delivered smoking cessation support within a call-back counselling framework. Receiving proactive calls from trained counsellors was showed to be efficacious over receiving printed information or receiving a brief counselling intervention at the first point of contact. Moreover, Stead and colleagues reported a dose-response relationship, whereby receiving more calls was associated with better cessation outcomes. Gates and Albertella (2016) identified one controlled study of risky alcohol reduction helpline and one call from an alcohol specific helpline was associated with

increased likelihood of abstinence at six month follow-up compared to the no intervention control group.

Are Telephone-Based Specialist Health Risk Behaviour Change Services Provide Adequate Preventive Health Care for People with Mental Health Disorders?

Two recent systematic reviews of interventions to improve health risk behaviours of people with a mental health disorder have indicated that there is currently limited high quality evidence to unequivocally support the effectiveness of behavioural interventions on health risks and health risk behaviours (De Rosa et al., 2017; McGinty, Baller, Azrin, Juliano-Bult, & Daumit, 2015). A key issue cited is the high rates of study attrition related to logistical barriers getting to appointments to support health behaviours (Beebe et al., 2011; Scheewe et al., 2013). This suggests that finding alternative options to face-to-face appointments might help to support people improve engagement with services to improve health risk behaviour.

To date, no systematic reviews of telephone-based health risk behaviour change interventions has been undertaken with people with a mental health disorder. However, a number of trials have been implemented exploring the feasibility and effectiveness of delivering health behaviour change coaching or support via telephone to people with a mental health disorder (Baker et al., 2014; Temmingh et al., 2013). Temmingh and colleagues delivered a 12 month telephone-based health behaviour change intervention to 761 participants with moderate to severe (but well controlled) mental health conditions (56.8% bipolar affective disorder, 19.7% schizophrenia spectrum disorders, 18.5% depressive disorders, 5% other). The intervention included weekly telephone calls from dieticians or exercise physiologists for three months, with monthly calls occurring from then until study completion. The primary aim of the intervention was to improve physical activity and diet, and to reduce weight, waist circumference and body mass index (BMI). Temmingh and colleagues observed a statistically significant mean reduction in weight of 4.8kg and a mean

reduction in waist circumference 6.8cm. The proportion of participants categorised as obese (BMI > 30) dropped from 52.25 to 42.4%. There are some limitations to consider when interpreting the findings from this study, including a reliance of self-reported anthropometric outcomes and health behaviour engagement (physical activity and diet). The authors reported a relatively high attrition rate of 38.6%, despite excluding participants on the basis of mental health stability. Given one of the benefits of using a telephone-based approach among people with a mental health disorder is an apparent reduction in logistical barriers and the capacity to engage where it most suits participants, this limits the extent to which we can make assessment on the feasibility of this intervention approach with people with more complex needs.

Baker and colleagues (2014) undertook a single group pre-post study with participants with a lifetime diagnosis of a psychotic disorder. The intervention involved eight on-hour telephone sessions delivered within a motivational interviewing framework. Goals were developed collaboratively, with a focus on increasing fruit and vegetable consumption as a primary goal, and decreasing sedentary behaviour, smoking and/or alcohol use as possible secondary goals. Seventeen participants completed baseline and follow-up measures. Statistically significant improvements in fruit and vegetable intake, overall diet quality, and sedentary behaviour (decreased screen time) were observed. Moreover, the majority of participants indicated they were very satisfied with the intervention. These outcomes should be viewed in light of some limitations, including the small sample size, lack of control group, and reliance on self-report data. Despite these limitations, the behavioural and participant satisfaction outcomes suggest that telephone-based intervention was both a feasible and acceptable method of improving health behaviours among this population.

These systematic reviews highlight the potential benefits of telephone-based health behaviour change interventions. However, making meaningful, population-level changes to

health and health behaviour requires considerable investment and infrastructure. In Australia, federal and state governments have acknowledged the increasing burden placed on citizens by poor health and health behaviours. The New South Wales Office of Preventive Health, tasked with reducing health disparities in the community, developed and implemented the Get Healthy Information and Coaching Service to redress these disparities.

The Get Healthy Information and Coaching Service

The Get Healthy Information and Coaching Service (GHS) is a free telephone-based information and coaching service that was introduced and funded by the New South Wales government in February 2009. The purpose of the service is to support healthy lifestyle change among the general population. In particular, the GHS was designed to target improvements in nutrition and physical activity, and to reduce increasing rates of overweight and obesity. Since inception, the GHS has been expanded to include six programs: the standard coaching program; an information only program (clients receive printed information with tips to improve physical activity and diet as well as a one-off coaching call); a pregnancy program (includes 10 coaching calls and printed materials with targeted goals for pregnant women); type 2 diabetes prevention program (for people at increased risk of type 2 diabetes, includes 13 coaching calls); a targeted program for clients who identify as being Aboriginal and/or Torres Strait Islander people (includes 13 coaching calls and information tailored for Aboriginal and Torres Strait Islander communities); and an alcohol reduction program (people aged 18 years or over, specifically targeted to reducing alcohol). The original GHS Coaching program remains the central program from which these additional programs have been adapted.

The GHS Coaching Program is a six month telephone-based healthy lifestyle behaviour change service that is delivered by university-trained health coaches who received additional specialty training in motivational interviewing techniques (O'Hara, Bauman, et al.,

2013; Rollnick & Miller, 1995). Ten individually-tailored coaching calls are made across the six month period, with a greater frequency of calls (n=6) occurring the first half of the program (O'Hara, Bauman, et al., 2013). The focus of the calls during this phase of the program is on developing goals, motivation, and specific strategies to overcome potential barriers to behaviour change (Palmer, Tubbs, & Whybrow, 2003). In the latter half of the program less calls are made (n=4), with a greater focus on preventing relapse to risky health behaviours (Marlatt & Donovan, 2005). Participants are encouraged to shape goals in relation to weight management, including developing healthier eating habits and increasing physical activity. Although data relating to smoking status and alcohol consumption is routinely collected, participants wishing to specifically improve these behaviours are referred on to Quitline, or to the GHS Alcohol Reduction Program respectively. The GHS Coaching Program has been shown to be effective in improving health risks and health risk behaviours among the general population (O'Hara et al., 2012; O'Hara, Phongsavan, et al., 2013)

O'Hara and colleagues have completed an evaluation of the GHS Coaching Program at graduation (six months post-baseline) from the program (O'Hara et al., 2012), and have explored the maintenance of program effects at 12-month follow-up (O'Hara, Phongsavan, et al., 2013). Data were analysed from the initial 1440 clients who enrolled in the GHS, provided sufficient data at each time point (baseline, midpoint [i.e., 3 months post-baseline], graduation [i.e., 6 months post-baseline]), and who had consented for their data to be used in any evaluation of the service. At graduation, O'Hara and colleagues observed that participants self-reported significant improvements in mean body weight (kilograms), and a greater proportion of participants were categorised as being at an acceptable BMI (indicating a decline obesity rates), and a lesser proportion reported a risky waist circumference. Participants also reported significant improvements in the number of physical activity sessions completed each week and a greater proportion met sufficient physical activity

guidelines at graduation. Significant increases in the number of fruit and vegetables servings consumed each day, and significant decreases in daily consumption of sweetened drinks and weekly consumption of takeaway meals were also reported. O'Hara and colleagues (2013) collected data from 277 participants from the initial GHS Coaching Program cohort at six month follow-up (i.e., 12 months post-baseline). They observed that there were no significant changes in weight, waist circumference, BMI, and fruit and vegetable intake between graduation and six month follow-up, suggesting post-program improvements were maintained. Improvements made in physical activity from baseline to graduation were not maintained at the six month follow-up (i.e., 12 months post-baseline).

Could the GHS Be an Effective Health Risk Behaviour Change Service for People with a Mental Health Disorder?

The behavioural, anthropometric, and participant satisfaction outcomes from existing studies of telephone-based interventions for people with a mental health disorder, coupled with the data regarding the effectiveness of the GHS, suggest that the GHS could be an effective population-level health behaviour change strategy in the short-term, and that improvements in health risks and health risk behaviours can be maintained in the longer-term. Previous research has highlighted the importance of tailoring behaviour change support to the particular needs of subgroups (Chen, Reid, Parker, & Pillemer, 2013; Ward, White, & Druss, 2015). As outlined above, the GHS has already invested in tailoring the GHS program for a number of at-risk population subgroups. Given the complexity of issues that people with a mental health disorder face in managing their physical health (Lawrence et al., 2013), and the barriers that exist to delivering and receiving health behaviour change services for people with a mental health disorder (Bartlem, Bowman, Freund, et al., 2015; Bartlem et al., 2016), it is pertinent to explore the impact of the GHS for people with a mental health disorder. The GHS routinely collects data related to receipt of previous mental health treatment. However,

to date, the GHS has not been evaluated in terms of examining the impact of Coaching program for clients with a history of mental health issues in comparison to those without mental health issues. A greater understanding of how the GHS works for people with a mental health disorder could provide a strong empirical foundation from which to explore how best to maximise the utility of the GHS this population subgroup. The aim of the research described in this thesis is to explore the impact of the GHS on anthropometric outcomes (i.e., body weight, waist circumference, body mass index) and health behaviours (i.e., physical activity, nutrition) for people who report previously receiving treatment for a mental health disorder.

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Manuscript: Evaluation of the Get Healthy Information and Coaching Service for People Who Have Previously Received Treatment for a Mental Health Disorder

Tim Regan[1]

[1]School of Psychology, The University of Newcastle, University Drive, Callaghan, New South Wales, Australia

Corresponding author: Tim Regan, timothy.regan@uon.edu.au

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Abstract

People with a mental health disorder experience a disproportionate physical disease burden compared to people without a mental health disorder. This burden includes decreased life expectancy and increased mortality associated with chronic disease. In part, this disparity can be attributed to an increased prevalence of health risk behaviours, including poor nutrition and physical inactivity, compared to people without a mental health condition. Previous research indicates improving risky health behaviours among people with a mental health condition at a population-level is difficult. Existing behaviour change services might provide a more effective option for improving these behaviours. We analysed pre-post evaluation data of 3,304 clients of the Get Healthy Information and Coaching Service (GHS), a free telephone-based health behaviour coaching program based in New South Wales, Australia. Results indicated that more than 25% of GHS participants reported previously receiving treatment for a mental health disorder. Participants who have received treatment for a mental health disorder reported a greater prevalence of anthropometric risks (weight, waist circumference, BMI) and health risk behaviours (nutrition, physical activity) at baseline compared to those without a mental health disorder. At six month follow-up, participants with a mental health disorder reported improvements in anthropometric and health risk behaviours. The magnitude of change was similar to participants without a mental health disorder, except for smaller changes in weight and waist circumference. The GHS appears to help support healthy lifestyle changes for people with a mental health disorder. More research is needed to optimise the GHS for people with a mental health disorder.

Evaluation of the Get Healthy Coaching Service for People Who Have Previously Received Treatment for a Mental Health Disorder

People with a mental health disorder experience a disproportionately larger burden of physical health issues compared to people without a mental health disorder. For example, several international studies demonstrate that rates of chronic physical disease, such as cardiovascular disease (Correll et al., 2017), cancer (Chou, Wang, Lin, & Kao, 2017), diabetes (Vancampfort et al., 2016), and respiratory diseases (Partti et al., 2015), are consistently greater among people with a mental health disorder. Moreover, rates of mortality related to chronic disease are notably higher, with cardiovascular disease-related mortality estimated to be 2.6 times greater, and respiratory disease-related mortality estimated to be 4.9 times greater than the general population (Brown, Kim, Mitchell, & Inskip, 2010). The, increased prevalence of health risk behaviours among this population are considered one of the most influential factors for this disproportionate burden (Bartlem, Bowman, Bailey, et al., 2015; Scott & Happell, 2011).

Common health risk behaviours include poor diet and physical inactivity, smoking, and alcohol misuse, which collectively account for almost 20% of the global disease burden (Lim et al., 2012). Research consistently demonstrates that the prevalence of of each of these behaviours is greater among people with a mental health disorder than the general population (Bartlem, Bowman, Bailey, et al., 2015; Scott & Happell, 2011). Prevalence rates for smoking in the general Australian population are approximately 13% (Australian Bureau of Statistics, 2017), compared to up to 65% among people with a mental health disorder (Bartlem, Bowman, Bailey, et al., 2015; Cooper et al., 2012; Lawrence, Mitrou, & Zubrick, 2009). For alcohol, 17.4% of the general population reported exceeding lifetime risk guidelines (Australian Bureau of Statistics, 2017) compared to 35.3% of people with a mental health disorder (Bartlem, Bowman, Bailey, et al., 2015). Rates of insufficient physical activity have been estimated at approximately 45% among the general population (Australian

Bureau of Statistics, 2017), whereas they have been estimated to be 71.1% among clients of community mental health services (Bartlem, Bowman, Bailey, et al., 2015) and as high as 97% among people living with a chronic psychotic disorder (Hahn et al., 2014). Rates of inadequate fruit intake have been estimated at up to 50.2%, and inadequate vegetable intake 92.9%, among the general population (Australian Bureau of Statistics, 2017), compared to rates of inadequate fruit consumption of approximately 74%, and inadequate vegetable consumption of approximately 89% among people with a psychotic disorder (Hahn et al., 2014).

Addressing the disproportionate burden chronic disease behaviour among people with a mental health disorder has been identified as a health priority by the World Health Organisation (World Health Organization, 2002) and the Australian government (Australian Institute of Health and Welfare, 2016; Willcox, 2014). Previous research has shown that delivery of preventive care by frontline mental health care providers, including community mental health services and General Practitioners (GPs), is suboptimal for people with a mental health disorder (Anderson et al., 2013; Wye et al., 2009) (Lawrence & Kisely, 2010). The reasons for this include erroneous staff perceptions that people with a mental health disorder do not want to help with health risk behaviours, a lack of knowledge regarding how best to deliver preventive care, and a lack of knowledge regarding available referral pathways for people with a mental health disorder (Bartlem, Bowman, Freund, et al., 2015; Bartlem et al., 2016; Happell, Scott, & Platania-Phung, 2012; Young, Praskova, Hayward, & Patterson, 2017).

Telephone-based behaviour change services, such as the Get Healthy Information and Coaching Service (GHS; www.gethealthynsw.com.au), have been identified as alternative preventive care strategies to improve health risk behaviours. An evaluation showed that at six month follow-up, participants reported statistically significant improvements body weight

(kilograms) compared to baseline. Moreover, at six month follow-up a greater proportion of participants were categorised as having a less risky Body Mass Index (BMI) and a less risky waist circumference (centimetres) compared to baseline. Statistically significant improvements in health risk behaviour (physical activity; nutrition) were also reported. Despite improvements being made by GHS service users in general, to date, no research has explored the impact of the GHS for people with a mental health disorder. The aims of the current study were to:

1) Compare the demographic and baseline chronic disease risk profiles of GHS Coaching participants who have previously received treatment for a mental health disorder to participants who have not previously received treatment.

2) To compare changes in anthropometric (weight; waist circumference; BMI) and chronic disease risk behaviours (nutrition and physical activity) from baseline to six month follow-up of GHS Coaching participants who have previously received treatment for a mental health disorder to participants who have not previously received treatment.

Methods

Study Design

A pre-post evaluation design was used to determine within and between group differences on anthropometric and health risk behaviour outcomes for people who have previously received treatment for a mental health disorder and people who have not previously received treatment for a mental health disorder. Ethics approval was obtained from the University of Newcastle (approval No. H-2016-0270) Human Research Ethics Committee.

Participants

The GHS is available to residents of New South Wales, South Australia, and Queensland via a toll-free telephone number. Participants are able to self-refer to the GHS or can be referred by a health professional. The eligibility criteria for the Coaching program are: aged 18 years or older and medically suitable. To determine medical suitability prior to enrolment in the

Coaching program, participants are asked to describe any chronic illnesses, heart/lung/brain illnesses, pregnancy and breastfeeding, dietary issues, or mental health issues. If an existing health issue is identified, participants are referred to their general practitioner to obtain a medical clearance before they can participate in the Coaching program. In the current study, the data were taken from participants who enrolled between 1 January 2015 and 30 June 2016. Participants can self-refer to the GHS online or by telephone, or can be referred to the program by a health professional (e.g., GP, mental health clinician).

The GHS Coaching Program

The GHS Coaching program is a six month telephone-based healthy lifestyle behaviour change service that is delivered by university-trained health coaches who received additional specialty training in motivational interviewing techniques (O'Hara et al., 2013; Rollnick & Miller, 1995). Ten individually-tailored coaching calls are made across the six month period, with a greater frequency of calls (n=6) occurring the first half of the program (O'Hara et al., 2013). The focus of the calls during this phase of the program is on developing goals, motivation, and specific strategies to overcome potential barriers to behaviour change (Palmer, Tubbs, & Whybrow, 2003). In the latter half of the program fewer calls are made (n=4), with a greater focus on preventing relapse to risky health behaviours (Marlatt & Donovan, 2005). Participants are encouraged to shape goals in relation to weight management, including developing healthier eating habits and increasing physical activity. Data collection points are baseline, midpoint (six calls, three months post-baseline), and graduation (ten calls, six months post-baseline). The GHS also delivers an information only version of the program that includes one phone call at baseline only and written materials posted to the participant. The GHS also delivers targeted coaching programs, including programs for Aboriginal and Torres Strait Islander people; people with type 2 diabetes; a perinatal program for women; and a specific alcohol reduction program.

Data Collection

Measures were routinely collected service data collected by GHS coaches using a computer-assisted telephone interview (CATI). CATIs have demonstrated similar reliability in context of collecting health-related data as face-to-face or self-directed online survey (Graham et al., 2006). Only data captured at baseline and at six months are include in this study.

Measures

Socio-demographic variables.

Gender, age, education level, employment status, language spoken at home, and Aboriginal/Torres Strait Islander status were assessed based on questions developed from the NSW Population Health Survey (Population Health Division, 2009). The socioeconomic status of participants was determined using their postcode to identify the Socio-Economic Indexes for Areas (SEIFA; Australian Bureau of Statistics, 2006). Participant postcodes were also used to categorise geographical location using the Accessibility Remoteness Index of Australia Plus (ARIA; Australian Institute of Health and Welfare, 2004). Participants self-reported having previous treatment for a mental health disorder by answering 'yes' or 'no' to the question *"Have you had significant mental health problems that required treatment from a health professional?"*. This variable was used as a proxy indicator to identify two separate groups: participants with a possible current or past mental health disorder (MHD), and those without a current or past mental health disorder (non-MHD).

Primary outcomes.

Anthropometric risk factors and chronic disease health risk behaviours were assessed at baseline, three month follow-up and six month follow-up. Only baseline and six month follow-up data were included in this study.

Anthropometric risk factors. Anthropometric risk factors were self-reported weight (kilograms), body mass index (BMI, kg/m^2), and waist circumference (centimetres). BMI risk categories were calculated as 'underweight/acceptable (BMI 10-24.99), 'overweight' (BMI 25-29.99), 'obese' (BMI $\geq$ 30; Australian Bureau of Statistics, 2012). Waist circumference

risk categories were calculated separately for males and females. For males, a waist circumference<94cm indicates no risk, whereas ≥94cm indicated increased risk of chronic disease (Australian Bureau of Statistics, 2012). For females, a waist circumference <80 cm indicates no risk, ≥80cm increased risk (Australian Bureau of Statistics, 2012).

Health risk behaviours. Physical activity was assessed using a well validated brief screening measure (3Q-PA; Smith, Marshall, & Huang, 2005). Participants self-reported the number of 30 minute walking sessions they usually complete each week, the number of 30 minute sessions of 'moderate' physical activity sessions they usually complete each week, and the number of 20 minute 'vigorous' physical activity sessions they usually complete each week. Sufficient physical activity was categorised as completing five or more sessions of any combination of walking, moderate physical activity, and vigorous physical activity, or completion of four or more vigorous physical activity sessions per week (Smith et al., 2005). Insufficient physical activity was defined as completing less than five sessions of combined walking, moderate, or physical activity, or less than four sessions of vigorous physical activity.

Nutrition was assessed by the number of serves of fruit and vegetables usually consumed each day. Nutrition risk was categorised as those meeting fruit and vegetable guidelines (≥ serves fruit/day; ≥ 5 serves vegetables/day) and those not meeting the guidelines (<2 serves fruit/day; <5 serves vegetables/day; National Health and Medical Research Council, 2013). Additional nutrition indicators were also assessed: the number of sweetened drinks (e.g., cups of soft drink, cordial, sports drinks) consumed each day, and the number of takeaway meals or snacks consumed each week.

Participants were also asked to rate their overall health from one of five options: poor, fair, good, very good, excellent.

Variable transformation.

Age was transformed from continuous to categorical form (18-39, 40-59, 60+). The following categorical variables were transformed to two levels: education (up to year 12, TAFE/university and higher), employment (any employment, no employment), language spoken at home (English, other), Aboriginal and Torres Strait Islander status (Aboriginal and/or Torres Strait Islander, neither Aboriginal and/or Torres Strait Islander). Self-reported overall health was transformed into three categories: fair/poor; good; excellent/very good.

Data analysis.

Data analyses were undertaken using IBM SPSS Statistics version 24 (IBM Corp., 2016). Chi-square analyses were used to compare baseline demographic variables between mental health disorder (MHD) and non-MHD participants (Table 1). Matched (within-individual) paired t-tests were performed to determine changes in weight (kg), BMI, waist circumference (cm), number of walking/moderate/vigorous physical activity sessions per week, daily fruit and vegetables serves, daily consumption of sweetened drinks, and weekly consumption of takeaway foods (Table 2). Proportions were calculated to describe participants in relation to risk criteria on anthropometric outcomes or health behaviours at baseline and six month follow-up (Table 3). Between subjects t-tests were undertaken to compare differences in mean change scores between MHD and non-MHD groups (Table 4). Generalised linear mixed models (GLMMs) were used to determine changes in the proportion of participants who were categorised as meeting increased risk criteria on anthropometric outcomes or health behaviours. The impact of MHD on GHS coaching program outcomes was explored by time (baseline, six month follow-up) and group (MHD, non-MHD) interaction. The fixed effects part of the GLMM included main effects of MHD, time, and the time by MHD interaction. The random effects part of the model included a single random intercept to account for between subject variability.

Results

Between 1st January 2015 and 30th June 2016, the study sample included 3304 participants enrolled in the GHS Coaching program. At the time of analysis, 43.6% (*n* = 1441) participants were defined as terminated (i.e., had actively withdrawn or could not be followed up), 44.2% (*n* = 1460) participants were still defined as active (i.e., had not completed the program nor withdrawn). The remaining 12.2% (*n* = 403) were defined as having completed the program and provided at least self-reported anthropometric data during the final data collection time point and were eligible to be included analyses of participants who completed the coaching program.

Prevalence of Previous Treatment for a Mental Health Disorder

Within the study sample, 3190 participants that provided data for the question *"Have you had significant mental health problems that required treatment from a health professional?"*; 25.5% (*n* = 814) self-reported having had significant mental health problems that required treatment from a health professional.

Socio-demographic Profiles of Mental Health Disorder (MHD) and Non-MHD Participants

Comparisons between MHD and non-MHD participants demonstrated differences in terms of distributions of age, education, employment, and language spoken at home (Table 1). MHD participants were more likely to be older than non-MHD participants; less likely to have tertiary education; less likely to be in paid employment; and were more likely to report English as the primary language spoken at home.

Baseline Differences on Anthropometric Measurements, Health Risk Behaviours, and Self-Reported Health

Primary outcomes.

Anthropometric measurements.

At baseline, including all participants in the study sample, participants with a MHD reported greater mean weight (MHD = 87.68kg, non-MHD = 82.44; t = -5.01, df = 2313, p =.000), greater mean BMI (MHD = 30.3, non-MHD = 29.5; t = -5.351, df = 2276, p=.000), and greater waist circumference (MHD = 99.19cm, non-MHD = 95.49; t = -4.2, df = 1872, p =.000).

Health risk behaviours.

Physical activity.

Table 2 shows that at baseline, on average, participants in the MHD group reported fewer vigorous physical activity sessions each week (MHD = 0.38, non-MHD = 0.59 t = 3.062, df = 2224, p =.002), fewer moderate physical activity sessions each week (MHD = 1.82, non-MHD = 2.33; t = 3.793, df = 2228, p =.000), and fewer walking sessions each week (MHD = 1.3, non-MHD = 1.67; t = 3.088, df = 2224, p = .002; Table 3).

Nutrition.

Table 2 shows that participants in the MHD group reported consuming fewer serves of fruit per day (MHD = 1.33, non-MHD = 1.5; t = 2.526, df = 2207, p = .012; Table 3) and fewer serves of vegetables per day (MHD = 2.32, non-MHD = 2.55; t = 2.857, df = 2205, p = .004) at baseline compared to participants in the non-MHD group. Participants in the MHD group reported consuming more sweetened drinks per day compared to the non-MHD group at baseline (MHD = 0.65, non-MHD = 0.32; t = -5.189, df = 2187, p <.001). There was a difference between MHD and non-MHD participants for number of takeaway meals and snacks consumed each week (MHD = 1.36, non-MHD = 1.20; t = -1.734, df = 2189, p = .083).

Classification of risk for health behaviours.

Table 3 shows the classifications of risk for health behaviours by MHD and non-MHD group. Chi-square analyses were used determine baseline differences in the proportion

of participants in the MHD and non-MHD that met risk criteria categories across each health risk behaviour. Positive relationships were observed between having received treatment for a mental health disorder and BMI risk, χ^2 (2, N = 2278) = 17.856, p =.000), and recommended physical activity, χ^2 (1, N = 5.850) = 72.879, p =.016. Participants in the MHD group were more likely to be categorised as 'obese' and were more likely to report 'insufficient physical activity' than participants in the non-MHD group. No relationship was observed between waist circumference risk and recommended fruit and vegetables serves per day.

Overall health rating.

Chi-square analyses revealed a relationship between previously receiving treatment for a mental health disorder and baseline self-reported overall health χ^2 (2, N = 2187) = 72.879, p <.001). A greater proportion of participants in the MHD group reported having 'fair' or 'poor' overall health compared to participants in the non-MHD group (208/485 [42.9%] vs 397/1702 [23.3%]). Conversely, a lesser proportion of participants in the MHD group reported having 'good' overall health (188/485 [38.8%] vs 848/1702 [49.8%]) and 'very good' or 'excellent' health (89/485 [18.4%] vs 457/1702 [26.9%]).

Change in Health Risk Behaviours from Baseline to Six Month Follow-Up

Pre-post change in health risk behaviours.

Paired t-tests were undertaken to determine the effect of the GHS Coaching Program for program completers (Table 3). Participants in both the MHD and the non-MHD group reported improvements on all health risk behaviours except for moderate physical activity (Table 3). Participants in both groups reported improvements in weight, but no improvement in BMI. Participants in the non-MHD also reported improvements in waist circumference. Participants in the non-MHD group reported greater improvement in weight and waist circumference compared to participants in the MHD group (Table 4)

Pre-post change in classification of risk for anthropometric outcomes and health risk behaviours.

GLMMs were used to individually assess the interaction between time (baseline to six month follow-up) and MHD group (MHD, non-MHD) on change in classification of BMI risk, waist circumference risk, recommended fruit and vegetable intake, recommend physical activity, and self-reported health rating. No interaction between time and MHD group was observed for any of the health behaviours or self-reported health rating.

Discussion

This study demonstrates that a large proportion of GHS participants self-reported previous treatment for a mental health disorder. The study also demonstrates the potential of the GHS to deliver improvements in anthropometric outcomes (body weight, waist circumference BMI) and chronic disease risk behaviours (physical activity, nutrition) for people who have previously received treatment for significant mental health issues. The data indicate that the difference between mental health disorder (MHD) and non-MHD participants was similar on most outcomes. This study adds to the very limited literature regarding the effectiveness of population-level healthy lifestyle interventions for people with a mental health disorder, particularly around physical activity and nutrition (Meernik, McCullough, Ranney, Walsh, & Goldstein, 2017; Vickerman et al., 2015).

Overall, the demographics and changes in anthropometric and health behaviour results described in this study are generally consistent with the demographics and the direction of the results of a previous evaluation of the GHS (O'Hara et al., 2013). GHS clients included in the O'Hara evaluation reported greater mean reductions from baseline to six month follow-up in weight (3.9kg), BMI (1.5 BMI units), and waist circumference (5cm) than reductions reported by both MHD and non-MHD participants in the current study. In terms of health behaviours, participants in the O'Hara evaluation reported similar size

improvement in walking, moderate and vigorous physical activity, fruit and vegetable servings per day, sweetened drinks per day, and takeaway meals per week. However, given sub-group analyses by mental health status were not included in the evaluation undertaken by O'Hara and colleagues, direct comparisons between the evaluations in terms of mental health are difficult.

The outcomes in the current study are consistent overall with previous studies of telephone-based healthy lifestyle intervention programs (Temmingh et al., 2013) and feasibility studies (Baker et al., 2014; Lee, Kane, Brar, & Sereika, 2014). Temmingh and colleagues (2013) undertook a pre-post evaluation of a telephone-based health lifestyle intervention for people (n = 761) with serious mental illness and reported larger reductions in in weight (3.8kg) and waist circumference (5.8cm) at six month follow-up compared to MHD participants in the current study. Temmingh and colleagues' intervention was delivered by similar allied health staff as the current study (dieticians, exercise physiologists) who were trained in similar behaviour change strategies (motivational interviewing), but were more frequent initially (weekly for three months) than the GHS (six calls in first three months). In addition, diagnostic severity is clearer among this sample than for the GHS study sample and Coaching program completers. Despite a lack of control group in the Temmingh study to make direct comparison, more frequent coaching contact might be one way to enhance outcomes for people with a mental health disorder. Future studies of the GHS should explore the preference of contact frequency affects engagement and outcomes among participants with a mental health disorder.

The outcomes for MHD participants in the current study were generally consistent with results reported in previous systematic reviews and meta-analyses of studies where people with a mental health disorder who receive a face-to-face lifestyle intervention (Bonfioli, Berti, Goss, Muraro, & Burti, 2012; Teasdale, Ward, Rosenbaum, Samaras, &

Stubbs, 2016), but outcomes were of a lesser magnitude. Bonfioli and colleagues reported a pooled BMI reduction of 0.98 at the final follow-up point (Bonfioli et al., 2012), and a mena change in baseline body weight of approximately 3.1%. A separate systematic review and meta-analysis comparing 26 nutrition-based interventions to treatment as usual for people with serious mental illness (including schizophrenia spectrum disorders, bipolar affective disorder, depression without psychotic features) reported reductions in mean body weight (2.7kg), BMI (0.87 BMI units), and waist circumference (2.3cm; Teasdale et al., 2016).

Although improvements in anthropometric outcomes and health risk behaviour outcomes were observed for participants in the MHD group, these improvements were small to moderate in size and generally lower than what might be considered a meaningful change, insofar as the possible effect that improving health behaviours has on improving chronic disease risk. For example, losing at least 5% body weight has been associated with a reduced risk of breast cancer among females of 64% (Harvie et al., 2005), can slow down the onset of type II diabetes among males and females (Lindström et al., 2006), and can improve risk factors associated with cardiovascular disease (e.g., blood pressure, blood glucose) by up to 80% (Wing et al., 2011). Similarly, decreased risk of cancer, cardiovascular disease, arthritis and diabetes has been shown to be associated with decreasing BMI (Pi-Sunyer, 2009) and waist circumference (Ross & Janiszewski, 2008). BMI remained stable from baseline to six month follow-up for the MHD group, suggesting at the very least suggesting no increase in risk in chronic disease associated with participating in the GHS.

The limited change in anthropometric outcomes could be somewhat offset by improvements in some health behaviours (Janiszewski & Ross, 2009). On average, participants in the MHD group reported an increase 24 minutes of walking and 10 minutes of vigorous physical activity each week. Previous research has demonstrated that as little as 15 minutes of low intensity exercise can increase hypotension and improve blood pressure for

extended periods throughout the day, slightly reducing cardiometabolic and cardiovascular risk (Guidry et al., 2006). In contrast, despite improvements in nutrition, on average MHD participants did not meet recommended daily fruit (two serves or approximately 300 grams) and vegetable (five serves or approximately 375 grams) intake guidelines at six month follow-up (National Health and Medical Research Council, 2013). Evidence from a systematic review and meta-analysis indicate that consuming 350-800 grams per day of fruit is associated with a relative risk reduction of 21% for coronary heart disease, 20% for stroke, and 8% across all cancer types (Aune et al., 2017). For vegetables, consuming 500- 600 grams has been shown to be associated with a relative risk reduction of 30% for coronary heart disease, 28% for stroke, and 12% across all cancer types (Aune et al., 2017). MHD participants consumed on average 255 grams of fruit and 277 grams of vegetables. Despite improvements in physical activity and fruit and vegetable intake among MHD participants, there is still significant work to be done in order to reach the suggested nutrition and physical activity guidelines.

Limitations

The variable used to assess and group study participants by mental health status lacks appropriate sensitivity and specificity regarding the type, severity, onset, and frequency of mental health issues, as well as no information regarding the types of treatments received and/or currently being received. As such, the data reported in the current study should be considered a ‘proxy’ indicator for mental health status. Previous research has demonstrated that people with depression (Colombo et al., 2014; Komulainen et al., 2011), and people using powerful psychotropic medication (e.g., olanzapine; Evans, Newton, & Higgins, 2005) are less likely to engage with and complete lifestyle interventions that target physical activity and nutrition.

The proportion of participants included in this study that terminated their involvement (43.6%) is similar to that reported by Temmingh and colleagues (2013; 38%), and is well-below drop-out rates reported for other telephone-based healthy lifestyle programs among the general population (66%; Merrill, Bowden, & Aldana, 2010) and within previous GHS evaluations (O'Hara et al., 2013). Temmingh and colleagues reported greater drop-out among younger participants and participants with greater physical co-morbidities. Moroshko and colleagues (2011) reviewed predictors of drop-out from healthy lifestyle interventions among the general population and identified that participants with poorer mental health, those who were younger, and those who were less educated, were more likely to drop-out. Acknowledging and exploring similar barriers within the GHS context is needed to optimise the service for people with a mental health disorder.

The reliance on self-reported data is a somewhat unavoidable element of research undertaken within a translational framework. It should be noted that despite evidence that using computer-assisted telephone interviews (CATI) has been shown to be as reliable as face-to-face or self-directed online survey methods in collecting health data (Graham et al., 2006), the nature of the coaching intervention and reliance on self-report outcomes means that we should be cautiously acknowledge that consistency across all data collection activities is difficult to achieve. Within the previous GHS evaluation, O'Hara and colleagues (2013) included smaller sub-studies designed to validate the use of self-report data in the GHS, and to explore the impact of possible social desirability effects when participants report anthropometric and health behaviour outcomes to their GHS coach. These sub-studies indicated moderate-to strong correlations between self-reported data and objective anthropometric outcomes and health behaviour outcomes assessed among a small convenience sample of participants (n = 38).

Conclusion

The results of this study should be considered with a degree of caution and optimism. A large proportion of existing GHS participants reported receiving treatment for a significant mental health issue. The GHS demonstrated some potential in being able to improve chronic disease risk behaviours and anthropometric risks for people with a mental health disorder, despite not being specifically designed to meet the needs of this population. Moreover, outcomes for mental health disorder (MHD) participants were generally similar to those without a MHD. Although the data do not indicate a notable improvement in anthropometric outcomes, the data do suggest that a freely-available, population-level, telephone-based coaching intervention such as the GHS has potential as an effective intervention strategy for people with a MHD. However, more research is needed to determine how people with a MHD differ from those without a MHD in terms of their usage of the service. The GHS has a strong track record in optimising the delivery of its service to at-risk population groups (e.g., Aboriginal and Torres Strait Islander peoples; pregnant women). Consideration should be given to a more formal process evaluation of the GHS for people with a mental health disorder. For example, the current processes and routine data collection could be improved to better capture data relating to mental health for its participants, particularly with details regarding history, diagnosis, and current or past treatment. In addition, consistent with the GHS' previous efforts to optimise the service for Aboriginal and Torres Strait Islander peoples, this process evaluation could possibly include undertaking some qualitative exploration with key stakeholders (e.g., participants, GHS Coaches, mental health clinicians, GPs, carers) to identify the key aspects of the service that could be improved to better meet the needs of people with a mental health disorder.

Tables

Table 1

Baseline demographic profile of GHS Coaching Participants

		MHD		Non-MHD		χ^2	p-Value
		N	%	N	%		
Gender	Male	172	21.1%	536	22.6%	2.87	.236
	Female	642	78.9%	1840	77.4%		
Age	18-39	294	37.1%	962	41.4%	8.59	.035
	40-59	376	47.5%	971	41.8%		
	60+	122	15.4%	388	16.8%		
Education	No School /Primary School /Secondary School	302	38.1%	645	27.9%	31.96	.000
	Certificate/Diploma/ Degree or higher	491	61.9%	1669	72.1%		
Employment	Employed (Full-time/ Part-time/casual)	417	52.6%	1645	71.1%	90.59	.000
	Other (Home duties/Retired/Unemployed)	376	47.4%	669	28.9%		
Language spoken at home	English	778	98.9%	2205	97.1%	7.59	.023
	Other	9	1.1%	65	2.9%		
Aboriginal Status	Aboriginal	2	0.3%	3	0.1%	3.50	.173
	Non-Aboriginal	750	99.7%	2241	99.9%		
SES (SEIFA)	Quintiles 1, 2, 3 (Most advantaged)	402	51.1%	1270	54.9%	3.46	.063
	Quintiles 4, 5 (Least advantaged)	385	48.9%	1043	45.1%		
Region	Major cities	517	65.4%	1606	69.2%	4.00	.046
	Other	274	34.6%	715	30.8%		

Table 2

Anthropometric and health risk behaviour change amongst GHS Coaching Program completers

	MHD						Non-MHD					
	Baseline	**Six Months**	**95%CI of Difference**		***t***	**p-Value**	**Baseline**	**Six Months**	**95%CI of Difference**		***t***	**p-Value**
Weight (kg)	(n=86)		**Lower**	**Upper**			(n=271)		**Lower**	**Upper**		
mean	83.5	82.3	0.17	2.26	2.32	*p*=.023	81.8	79.3	1.97	3.03	9.30	*p*<.001
SD	19.8	21.0					18.9	18.2				
Waist Circumference (cm)	(n=72)						(n=241)					
Mean	95.9	94.6	-0.18	2.74	1.74	*p*=.086	96.4	92.5	2.66	5.28	5.98	*p*<.001
SD	14.8	15.1					16.3	13.0				
BMI (kg/m^2)	(n=93)						(n=287)					
Mean	30.5	30.3	-0.16	0.54	1.10	*p*=.274	28.7	28.5	-0.07	0.45	1.42	*p*=.157
SD	7.1	7.0					5.7	6.0				
Walking PA (no. 30 minute sessions/week)	(n=92)						(n=283)					
Mean	1.1	1.9	-1.31	-0.33	-3.30	*p*=.001	1.2	2.6	-1.78	-1.12	-8.62	*p*<.001
SD	1.8	2.1					1.9	2.6				
Moderate PA (no. 30 minute sessions/week)	(n=92)						(n=283)					
Mean	2.2	2.4	-0.88	0.42	-0.70	*p*=.485	2.8	3.0	-0.55	0.17	-1.06	*p*=.292
SD	2.7	2.9					2.9	2.9				
Vigorous PA (no. 20 minute sessions/week)	(n=92)						(n=283)					
Mean	0.2	0.7	-0.76	-0.15	-2.96	*p*=.004	0.43	0.77	-0.50	-0.17	-4.04	*p*<.001
SD	0.7	1.6					1.3	1.6				
Fruit (serves/day)	(n=91)						(n=283)					
Mean	1.4	1.7	-0.54	-0.06	-2.46	*p*=.016	1.5	1.8	-0.38	-0.13	-4.02	*p*<.001
SD	1.1	0.9					1.1	0.9				
Vegetables (serves/day)	(n=91)						(n=283)					
Mean	2.3	3.1	-1.04	-0.50	-5.76	*p*<.001	2.5	3.5	-1.15	-0.83	-11.93	*p*<.001
SD	1.6	1.5					1.6	1.5				
Takeaway meals (number/week)	(n=91)						(n=283)					
Mean	1.1	0.7	0.05	0.77	2.26	*p*=.026	1.3	0.6	0.49	0.84	7.58	*p*<.001
SD	1.6	1.1					1.8	1.0				
Sweetened drinks (number/day)	(n=91)						(n=283)					
Mean	0.6	0.3	0.02	0.53	2.13	*p*=.036	0.3	0.1	0.02	0.22	2.3	*p*=.022
SD	1.7	1.2					0.8	0.7				

Table 3

Baseline and six month follow-up risk factor profiles of GHS Coaching Program completers

		MHD				Non-MHD			
		Baseline		Six Months		Baseline		Six Months	
		N	%	N	%	N	%	N	%
BMI									
	Underweight & Acceptable (BMI 10.0-24.99)	79/495	16%	18/104	17.3%	348/1783	19.5%	70/299	23.3%
	Overweight (BMI 25.0-29.9)	153/495	30.9%	43/104	41.3%	678/1783	38%	129/299	43.0%
	Obese (BMI 30.0+)	263/495	53.1%	43/104	41.3%	757/1783	42.5%	100/299	33.3%
Waist Circumference									
	No risk (<94 male; <80 female)	56/492	11.4%	49/92	53.3%	249/1741	14.3%	158/289	54.5%
	Increased risk (≥94 male; ≥80 female)	436/492	88.6%	43/92	46.7%	1492/1741	85.7%	131/289	45.2%
Physical Activity									
	Sufficient PA	16/488	3.3%	7/99	7.1%	106/1738	6.1%	31/305	10.2%
	Insufficient PA	472/488	96.7%	92/99	92.9%	1632/1738	93.9%	274/305	89.8%
Fruit Serves/Day									
	Fruit < 2/day	283/485	58.4%	34/93	36.6%	924/1724	53.6%	100/287	34.7%
	Fruit ≥ 2/day	202/485	41.6%	59/93	63.4%	800/1724	46.4%	187/287	64.9%
Vegetable Serves/Day									
	Veg < 5/day	434/485	89.5%	78/93	83.9%	1502/1722	87.2%	213/287	74.0%
	Veg ≥ 5/day	51/485	10.5%	15/93	16.1%	220/1722	12.8%	74/287	25.7%
Overall Health Rating									
	Excellent/Very Good	89/485	18.3%	23/92	25%	457/1702	26.9%	126/287	43.8%
	Good	188/485	38.8%	46/92	50%	848/1702	49.8%	135/287	46.9%
	Fair/Poor/NA	208/485	42.9%	23/92	25%	397/1702	23.3%	26/287	9.0%

Table 4

Comparison of MHD and non-MHD baseline-six month follow-up mean change scores for anthropometric and health risk behaviour outcomes.

Outcome	Within-group mean pre-post difference	Between-group mean difference scores	*t*	p-Value	95% CI of difference	
					Lower	Upper
Weight (kg)						
Non-MHD (n=271)	-2.50	-1.28	-2.29	.023	-2.39	-0.18
MHD (n=86)	-1.22					
Waist Circumference (cm)						
Non-MHD (n=239)	-4.01	-2.73	-2.98	.003	-4.54	-0.92
MHD (n=72)	-1.28					
BMI (kg/m^2)						
Non-MHD (n=287)	-0.188	0.005	0.021	.983	-0.493	-0.504
MHD (n=93)	-0.194					
Walking PA (no. 30 minute sessions/week)						
Non-MHD (n=283)	1.45	0.63	1.93	.054	-0.01	1.27
MHD (n=92)	0.82					
Moderate PA (no. 30 minute sessions/week)						
Non-MHD (n=283)	0.19	-0.04	-0.10	.919	-0.76	0.68
MHD (n=92)	0.23					
Vigorous PA (no. 20 minute sessions/week)						
Non-MHD (n=283)	0.34	-0.12	-0.69	0.49	-0.45	0.22
MHD (n=92)	0.46					
Fruit (serves/day)						
Non-MHD (n=283)	0.26	-0.04	-0.293	.769	-0.30	0.22
MHD (n=91)	0.30					
Vegetables (serves/day)						
Non-MHD (n=283)	0.99	0.22	1.34	.813	-0.10	0.54
MHD (n=91)	0.77					
Takeaway meals (number/week)						
Non-MHD (n=283)	-0.66	-0.25	-1.39	.165	-0.62	0.11
MHD (n=91)	-0.41					
Sweetened drinks (number/day)						
Non-MHD (n=283)	-0.12	0.19	1.37	0.172	-0.07	0.39
MHD (n=91)	-0.27					

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