Charles Sturt University

RESEARCH PROTOCOL - VERSION 2.0

Project title: Not just a walk in the park: Implementing nature walking groups in rural mental health services as a transdiagnostic approach on mental health recovery.

UNIVERSITY OF WOLLONGONG AUSTRALIA

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1 PROTOCOL REVISION HISTORY

Version	Date	Amended text	Description
V1.2_Feb 2024_GdA	12.2.2024 – 14.2.2024	Global	Accept changes Inserted variety of mood scales Amended PISCFs
V1.3_Feb 2024_GdA	20.2.2024	Global	Accept changes Update cortisol testing Change co-analysis to member checking
V1.4_Mar 2024_JA	1/03/2024	Aims and research team	Revised order of aims, Added Mamun Huda to research team, removed Miles Holmes
V1.5_Mar 2024_GdA_JA_NS	13/03/2024	Data collection	Insert final saliva sample collection protocol, added walking group schedule, added statistical analysis
V_1.6_13 Mar 2024_NS	14/03/2024	Global	Include further details on routines and structure of the walks. Edited reference list. Edited Table 1. Amended PICFs to include the PHQ9. Amended PICFs to include Mamun on the consent forms. Included a list of appendices.
V_1.6_19 March 2024_NS	19/03/24	PICFs + NWG routines	Amended TCs job title, amended the NWG routines, changed PD's phone number
V_2.0_14 March 2024_NS	14/05/24	PICFs, survey, recruitment flyer, role of NS to include consent	Changes in response to GWHREC ethical review.

2 INVESTIGATORS

Investigator Name	Expertise and experience	Roles and responsibilities
Assoc. Professor Julaine Allan	Rural mental health and substance use implementation research, nature walking group implementation and research	**Principal Investigator** • Design and conduct Nature Walking Group • Protocol finalisation • Chairing team meetings • Recruitment and accreditation of clinicians • Site monitoring • Risk management and reporting • Publication of study reports
Dr Katarzyna Olcon	Social work research, qualitative and observational methods, nature walking group implementation and research	**Principal Investigator** • Design and conduct Nature Walking Group study • Protocol finalisation • Site monitoring • Supervision of data collection • Qualitative data analysis lead • Preparation and submission of manuscripts
Dr Nicole Snowdon	Rural health and substance treatment evaluation, project management, clinical trial management	**Principal Investigator** • Maintenance of protocol and version control • Ethics application and PISCFs • Management of clinicians • Data management • Preparation and submission of manuscripts • Day to day management of the study • Screening and participant consent
Ms Genevieve d'Ament	Mixed methods researcher, lived experience of mental illness as a carer	**Investigator / research associate** • Protocol preparation • Data management • Preparation and submission of manuscripts • Day to day management of the study

Investigator Name	Expertise and experience	Roles and responsibilities
Mr Pete Destry	Social Work & recovery methods, mental health service management and team leadership, service user support, nature walking group implementation	**Investigator / site co-ordination** • Reviewing progress of study and if necessary, agreeing changes to the protocol to facilitate the smooth running of the study. • Data verification and assessment of results • Preparation and submission of manuscripts • Disseminating project information, • Screening of potential participants • Data collection supervision • Implementation of nature walking groups • Risk assessments and participant support
Ms Tamiki Carr	Social Work & recovery methods, mental health service management and team leadership, service user support, nature walking group implementation	
Dr M. Mamun Huda	Biostatistician	**Investigator** • Reviewing progress of study and if necessary, agreeing changes to the protocol to facilitate the smooth running of the study. • Statistical analysis • Data verification and assessment of results • Preparation and submission of manuscripts
Professor Thomas Astell-Burt	Social epidemiology, nature and health, health services research	**Investigator** • Advice and consultation on study methods, data analysis and dissemination.

3 STUDY SUMMARY

Aims: This study aims to 1) evaluate the implementation of structured Nature Walking Groups (NWG) in mental health services, 2) identify the impact of facilitated nature contact for people living with severe and persistent mental health conditions, and 3) deliver evidence-based guidelines for service providers to implement and evaluate NWGs supporting future implementation and research.

Setting: Nature Walking Groups will be delivered in two sites in NSW – Orange (Non-Government Organisation) and Wollongong (Government led Mental Health Service).

Approach: The RE-AIM framework will be used to guide the collection of quantitative and qualitative data and their analysis.

Sample: Three groups of participants will be recruited; Group A – Intervention (n=40), Group B – non-walking group (n=40), and Group C – Nature Walking Group facilitators (n=10).

The intervention: A total of four NWGs over 12 months will be conducted in the two sites by the trained Nature Walking Group facilitators (Group C; n=10). Intervention participants (Group A; n=40) will participate in one NWG, receiving 1 hour per week in nature for a continuous period of 12 weeks (twelve walks per participant), while still also receiving treatment as usual (TAU). On each walk, facilitators will draw participant attention to one of the natural features and guide participants through stress reduction and mindfulness activities, lasting 3 to 10 minutes in duration. Individuals in Group B (control; n=40) will continue to receive TAU.

Data collection + procedures: Clinicians in both sites will be invited by site coordinators to undertake NWG facilitator training (Group C; n=10). Following training, facilitators will be invited to complete an Organisational Readiness Survey.

Information session will be held in each participating site, where researchers will recruit participants to either Group A (intervention) or Group B (non-walking). Participants in Group A and Group B will be invited to complete baseline surveys, and the first of three salivary samples to be collected at different intervals during the project for cortisol and Dehydroepiandrosterone (DHEA) testing (n=80).

Participants in Group A will then participate in the NWG intervention. Group A participants will be asked to complete a brief mood scale before and after each walk, and a researcher will complete ethnographic observations during the walk. Follow-up surveys will be completed by those in Groups A and B following the final walking group, and 3 months post-intervention.

Individuals who participated in the NWGs (Group A) will also be invited to a closing reflective focus group at the end of the twelfth walk to discuss their experiences of the groups. Follow-up phone interviews will be conducted with participants from Groups A to find out if they continued walking in nature and any reported longer term impact of the groups. Nature Walking facilitators (Group C) will be invited to participate in a focus group on their experiences delivering in the program.

De-identified aggregated client data to develop a descriptive profile of people using the services will be

provided by each participating site. Group A and B participants will be invited to participate in a member-checking workshop at the conclusion of data analysis. Any changes identified during these workshops will be incorporated into the final findings. Participants will be paid for completing measures as per the schedule listed at Section 10.3.

4 BACKGROUND

Forty-five percent of all Australians aged 16 to 85 years — 8.7 million people — will experience mental illness at some point in their life (AIHW, 2020). Mental illness and substance misuse are the second largest contributor (23%) of the non-fatal burden of disease in Australia (AIHW, 2019) with $9.9 billion being spent on mental health in 2017–18 (AIHW, 2020). Given the prevalence and social and economic costs of mental illness, ensuring the access to, and effectiveness of mental health interventions is crucial.

The potential of nature contact for mental health recovery: There has been a growing interest in nature-based interventions, such as Nature Walking Groups (NWG), to prevent and address mental health symptoms (e.g., Marselle et al., 2019). Nature-based interventions have been shown to reduce negative mental health symptoms such as stress, anxiety and depression (Harvard Health Publishing, 2018; Marselle et al., 2019; Maund et al., 2019; Townsend & Weerasuriya, 2010). Contact with nature is associated with improvements in memory, cognition, and attention (Berto, 2014; Bratman et al., 2015) reduction in symptoms of depression and anxiety (Bloomfield, 2017; Grassini, 2022; Maund et al., 2019) lower stress levels (Corazon et al, 2018; Shunda et al., 2020; van den Berg & Beute, 2021) and healthy sleep patterns (Sia et al., 2020). Studies have also found that nature-based interventions such as forest bathing (Ideny et al., 2017), and community gardening (Howarth et al., 2020), resulted in greater levels of confidence, feelings of self-worth, happiness, feeling of safety, and sense of purpose and empowerment (O'Brien, 2018; Picton et al., 2018; Richardson et al., 2020; Sia et al., 2020). Nature exposure has also been linked with lower incidence of loneliness (Astell-Burt et al., 2022). When offered in groups, nature-based interventions create opportunities for social connections alleviating loneliness (Maund et al, 2019), which is one of the main indicators of mental and social wellbeing (Gierveld & Tilburg, 2006). Participating in nature-based interventions with others with similar lived experiences can enhance engagement, feelings of togetherness and belonging, and improve social skills (Maund et al., 2019; Richardson et al., 2020). Further, the physical exercise aspect of nature-based interventions can offer additional benefits to participants. There is an extensive body of literature describing the positive impact of physical activity on both physical and mental health (e.g., Ströhle, 2009; WHO, 2019). For example, a systematic review and meta-analysis of eight studies revealed that walking had a statistically significant, large effect on the symptoms of depression (Robertson et al., 2012). Similarly, according to the World Health Organization (2019), risk for depression can be reduced by up to 45% by increased physical activity.

Barriers to nature contact for people with enduring mental illness: The impact of enduring mental illness on people's circumstances is significant. It limits many people's ability to work, study and socialise resulting in poverty-related disadvantage such as poor housing, poor physical health, and social isolation (Migliorini et al., 2022). By middle-age, people with enduring conditions are likely to have experienced multiple episodes of illness and treatment. For these reasons, many people with enduring conditions prioritise improvement in social and functional outcomes over reduction in clinical symptoms (Barnett et al., 2022). People who regularly use green space (parks, gardens, bushland) and blue space (rivers, lakes, beaches) are more likely to have better mental, physical and social health than those who do not access these environments (Astell-Burt et al., 2020; Berto, 2014; Corazon et al., 2018). In terms of financial impact and efficiency, walking groups have the

potential to provide economic relief in several health-related areas. It is a cost-effective healthcare approach that can be used as a treatment alongside pharmacological and other non-pharmacological approaches (Hanson et al., 2015; Marselle et al., 2019). Despite the clear benefits of engaging in nature, individuals experiencing enduring mental illness and socio-economic disadvantage face multiple barriers to accessing these spaces, when compared to healthier, socio-economically advantaged individuals (Astell-Burt et al., 2014; Shanahan et al., 2019). These barriers restrict their ability to engage with and experience benefits from natural environments.

Preliminary research: This project is informed by a small preliminary study completed by the research team in 2022 where ten people participated in NWG as part of their mental health care. Group participants perceived them as rewarding and helpful, reducing their isolation and having a positive impact on their mental health. Moreover, they described usually experiencing difficulties accessing nature because they had no nature reserves near their housing, limited transport options, they could not afford park access fees and they had no experience with, or knowledge of nature reserves in the region (Olcon et. al., 2023). Nature Walking Group participants reported not wanting to walk on their own because of anxiety about transport logistics, getting lost, being alone and not having the motivation to deal with all those concerns (Olcon et. al., 2023). Further, our previous study demonstrated that clinicians supported NWGs but there is a lack of organisational capacity to implement them and concern about risks including the cost of the intervention (Tambayah et. al., 2022).

Based on these findings the proposed study considers the priorities, views, and values of both potential participants with enduring mental illness and healthcare providers in the way the NWGs are organised and run, and in the methods used achieve the project outcomes including evaluating organisational readiness, assessing the cost of implementation, and identifying the benefits of nature contact.

4.1 Aims

This research aims to explore the impact and the benefits of a NWG specific to the community mental health setting. The project will investigate the implementation and impact of walking and engaging with nature for participating consumers in two Australian community mental health services, one rural Non-Government mental health service (LikeMind) and one urban Government-led service (Illawarra Community Mental Health Service). Specifically, the project aims to:

1. Evaluate the implementation of structured NWGs in mental health services,
2. Identify the impact of facilitated nature contact for people living with severe and persistent mental health conditions,
3. Develop evidence-based guidelines for service providers to implement and evaluate NWGs supporting future implementation and research.

5 STUDY DESIGN

This study will employ a mixed methods design based on the RE-AIM framework to include the priorities, views and experiences of people with enduring mental illness and mental health care providers. As shown in Table 1, multiple methods of data collection and analysis will be used; wellbeing outcome measures – pre-, post-, and 3 month follow-up measures, salivary cortisol and DHEA testing pre- and post-intervention, ethnographic observation by a research assistant for each walking group, semi-structured interviews pre- and post-intervention, and member-checking workshops post analysis will be employed to determine the impact of the nature walking group intervention and identify contextual factors critical to its implementation in rural government and non-government health services.

5.1 Participating sites

The study will be conducted in two NSW locations – Orange (LikeMind, a Non-Government Organisation) and Wollongong (The Illawarra Community Mental Health Service, a Government Mental Health Service). Orange is classified as MMM3 – rural town, and Wollongong classified as MMM1 – major city . This will give us the opportunity to compare implementation in Non-Government Organisations and Government services and rural and urban sites.

Both sites support people with enduring and severe mental illness, such as major depressive disorder, bipolar disorder, and schizophrenia with an average age of 45 years (range 18–65). The ICMHS and LikeMind are in close proximity to either a variety of national parks and/or other green spaces. Therefore, the study will invite consumers presenting with a range of mental health conditions to participate.

5.2 Training workshop (Group C)

NWG facilitators for each site and the research team will attend training and implementation workshops in February 2024 to provide training to facilitators which ensures adequate practitioner knowledge and skills, and practical guidance on nature routine implementation processes and the participant recruitment and data collection tools. Potential facilitators will be identified by site study co-ordinators (PD and TC) and invited to attend the training workshop.

Table 1 - Data collection methods and corresponding aims

Aims	Data collection tool (*planned data analysis approach*)	RE-AIM component				
		Reach	**Efficacy**	**Adoption**	**Implementation**	**Maintenance**
1. Implementation of NWG	Organisational readiness survey *(Descriptive analysis)*			x		
	Ethnographic observations during NWG *(Thematic analysis)*				x	
	Closing reflective focus group *(Thematic analysis)*				x	
	Facilitator post focus group *(Thematic analysis)*			x	x	
	De-identified site wide client data *(Descriptive analysis)*	x				
	NWG attendance records *(Attendance ratio calculations)*				x	
2. Impact of NWG	Pre/post and 3 month follow-up survey *(Wilcoxon signed ranks)*^		x			
	Pre-post salivary cortisol and DHEA testing *(Change analysis)*		x			
	Before and after mood scale *(Change analysis)*		x			
1 + 2. Impact and implementation	Phone interviews (*Thematic analysis)*		x		x	
3. Develop implementation and evaluation guidelines	Member-checking workshop *(Thematic analysis)*					x
	Site comparisons *(Data triangulation)*				x	x
	Data guide feedback *(Guide draft reviewed)*					x

^The Patient Health Questionnaire – Anxiety and Depression Scale is the primary outcome measure.

Key

RE-AIM Component		
	Reach	Identify characteristics, perceptions, and health service utilisation NWG participants, compared to control.
	Efficacy	Identify changes in nature connection, wellbeing, social isolation, quality of life and confidence/self-esteem for participants and control. Understand what worked for different groups and why.
	Adoption	Explore facilitator and management experiences and the implementation barriers and facilitators. Identify similarities and differences in NWG implementation and impacts between sites.
	Implementation	Monitor the implementation process and the experiences of participants.
	Maintenance	Ensure findings and recommendations reflect the lived experience of participants and inform the NWG implementation and evaluation guide.

5.3 Sample

The study will have three groups of participants:

A. Intervention group - people using the mental health services of the partner organisation at the case study sites (n=40) who will participate in the walking groups,

B. Non-walking group - people using the mental health service of the partner organisation who choose not to participate in the walking groups, but consent to be involved in the research (n=40), and

C. NWG facilitators - employees of the partner organisations responsible for service delivery at the case study sites (n=10).

Forty participants will be recruited at each site (ICMHS and LikeMind) (n=80) from the mental health consumers receiving services. Approximately 100 consumers receive services at these agencies at any given time.

5.3.1 Group A - Eligibility criteria

The inclusion criteria for joining the NWG are following:

- Currently receives mental health services at ICMHS or LikeMind
- Shows interest and commitment to be part of a 12-week program of weekly nature walking groups
- Completed and passed the health moves assessment (see Appendix 12.7)
- Ability to walk unassisted for up to 60 minutes at low intensity (see the Grading System in Section 10.5)

The exclusion criteria:

- Cannot participate in at least 10 of the 12 scheduled NWGs
- Instability in current mental health, for example, a current intent or plan of suicide

5.3.2 Group B – Eligibility criteria

The inclusion criteria for the non-walking group include the following:

- Currently receives mental health services at ICMHS or LikeMind
- Is not interested in participating in the nature walking groups, or have not passed the health moves assessment and/or has been assessed by their primary physician as incapable of participating in the NWG's.

The exclusion criteria:

- Instability in current mental health, for example, a current intent or plan of suicide

5.3.3 Group C – Eligibility criteria

The inclusion criteria for the NWG facilitator group are;

- An employee of either ICMHS or LikeMind, or delivering services in collaboration with either service (e.g. in-kind services, or private practitioner),
- Participated in a NWG facilitator training workshop,
- Facilitated at least one NWG,
- Willing to complete an anonymous survey on the organisations readiness to implement NWG and participate in a focus group on their experiences delivering the program.

5.4 Recruitment (Groups A and B)

The research team will attend a facilitator training to introduce the project and explain the research steps and processes. Recruitment flyers will be distributed at each of the study sites (See Appendix 12.1). Each location will have a study co-ordinator (TC, LikeMind, and PD, ICMHS) who hold managerial positions in each study site. The study site co-ordinator at each site will provide treating clinicians with an overview of the study and NWGs. Clinicians can then discuss participation with existing clients on their caseload and provide them with information on the study and the contact details of the research team. Some treating clinicians will also be trained NWG facilitators, however, they will not enrol potential participants into the study, or gain consent. Once all potential participants have been connected with the research team to express their interest, an information day will be conducted by research team members at each site. People who cannot attend the information session will be followed up by the research team.

Potential participants will receive a Participant Information Sheet (see Appendix 12.3) where they can learn more about the research project. Specifically, that participation in the NWG will involve:

- completing an online or pen and paper survey at the commencement and conclusion of the 12-week session,
- completing a brief mood question, pre- and post- each walk,
- participating in a walk once a week for 12 weeks at a location they will be transported to,
- participating in a 2 hour closing focus group at the 12th walk,
- completing one phone interview with a member of the research team, and
- providing 3 saliva samples for cortisol and DHEA testing one week before commencement, at the end of the first walk and conclusion of the last walk but that this will be **optional**.

If people consent to be part of the research, they will be invited to join the first walk. If they do not wish to join the NWG, or if they are not eligible to participate due to the results of the screening assessment (See Appendix 12.7), they will be allocated to Group B and provided a Participant Information Sheet (Appendix 12.4) which will include all details relating to the measures included in the survey to be completed at the beginning and end of a 12 week period, and the optional collection of a saliva sample for cortisol and DHEA testing at the same time as completing the survey.

Informed consent will be obtained from each participant by the research team members at the information event. At least one week following this and one week before the first group walk, all participants will complete the study survey measures, and those participants wishing to participate in the cortisol and DHEA testing will provide a saliva sample. Study co-ordinators will provide assistance and support if required. Study co-ordinators will ensure participants are aware that participation is voluntary, and that participants can withdraw at any time. Participants will also be informed that while the surveys and ethnographic measures will be needed if they wish to participate, they will be told that the salivary testing is optional.

5.5 Intervention (Group A)

A total of four NWG over 12 months will be conducted in the two sites by the trained NWG facilitators. Intervention participants (n=40) will participate in one NWG, receiving 1 hour of time in nature for a continuous period of 12 weeks. Participants will be transported to and from each NWG location by the NWG facilitators. There will be no expectation to socialise with other group members but to remain in the group. Depending on weather variations in each location, the groups may be offered simultaneously or consecutively. Where available an educator such as a National Park ranger can join and refer to points of interest and answer any questions. The project funds will cover all costs of the intervention including backfill for clinicians if required.

5.5.1 Relaxation and mindfulness activities

Each NWG will take place in a natural environment, e.g., bush, countryside, National Parks, greenspace in urban areas (e.g., botanical gardens). Each walk will include two activities led by trained facilitator that draw participant's attention to one of the natural features of the site (water, birds, plants) and provide time to reflect on those features. The activities relate to psychological theories that link connection with nature as a pathway to health and wellbeing including Attention Restoration Theory (Ohly et al., 2016), and Stress Reduction Theory (Andrade & Devlin, 2015). Each activity is 2-10 minutes long and is matched with the optimal kind of nature known to facilitate a particular outcome. For example, nature with a high degree of textural diversity is known to be optimal for a stress reduction response. As shown in Table 2, several relaxation and mindfulness routines have been identified for possible inclusion in the NWG, and the study-site co-ordinators will finalise which routines and the locations where they will be used closer to the projects commencement. Each routine will include a script for facilitators to read, or there are audio versions that may be used (for example https://www.naturefix.life/feel-the-flow).

Table 2 – Summary of the relaxation and mindfulness activities under consideration for inclusion in the Nature Walking Group

Routine name		Summary	Length (minutes)
1.	Tune in to tune out	This abdomen breathing routine takes participants through a simple breathing strategy to take more effective breaths to increase their relaxation and decrease any stress.	2-4
2.	Peripheral Power	A vision activity that asks participants to use their wide-angle vision (peripheral vision) to trigger their parasympathetic nervous system that helps them to relax. It involves looking at items that move when looking straight ahead using their full wide-angle vision.	10
3.	Fingerprints of Nature	This routine guides participants through viewing the repeated patterns in nature.	5
4.	Beauty and Awe	This routine asks participants to look for five (5) beautiful things using all their senses and encouraging them to look in places they don't usually look.	3-10
5.	Sounds Good	This routine guides participants to notice sounds in six directions and make a sound map, asking why some places are quiet and others noisy.	3-7
6.	Introduce yourself to Country (spoken by Brett Groves - Wiradjuri man)	This routine introduces participants to the traditional First Nations practice of acknowledging Country.	2-3
7.	Conscious Breathing	Participants are asked to focus on their natural breathing pattern.	2-3
8.	Mindful moments	Participants are asked to engage their sight, touch, sound, smell and taste to mindfully notice the environment.	10
9.	Connection on the Move	Participants are asked to engage their peripheral vision, to listen to the environment in six different directions, do a brief body scan, and notice five beautiful things in their environment.	10
10.	Give Nature Gratitude	This routine guides participants through selecting a natural item using all their senses to help trigger happy memories and give gratitude to that memory	2-4
11.	Reflect and Connect	This routine asks participants to notice larger (trees) and smaller (thumb) elements in their environment.	10

5.5.2 Structure of each Nature Walking Group

Each of the 12 NWG will follow the same format, as follows;

- Transport and housekeeping
    - Participants will either be collected from their homes or will meet at a pre-arranged location at a specified time. Participants will be introduced to one another in the first group.
    - Participants will be transported to the walk locations by the trained facilitators.
    - Supported by social work student (TBC) participants will be asked to individually fill out the before walk mood scale (see Appendix 12.8).
    - Together as a group, facilitators will inform participants of the available facilities and the planned activities for the day.
    - Together as a group, facilitators will ask each participant for feedback on how they were able to implement the relaxation and mindfulness activities between group, as discussed in the previous NWG (this will commence in walk 2).
- Relaxation and mindfulness activities
    - Participants will be invited to participate in one of the pre-selected relaxation or mindfulness routine (see Table 2).
    - An additional routine (see Table 2) will be conducted that will be pre-selected dependent on the site location (e.g. water features, a view).
- Group close
    - Together as a group, participants will be invited to reflect on their experiences on the walk and routines, and asked what mindfulness and relaxation routines they plan to do during the week at home.
    - Participants will complete their after walk mood scale (see Appendix 12.8).
    - Participants are transported home.

5.5.3 Nature Walking Group schedule (TBC)

The exact locations of each walk and routines are to be finalised by each participating service, however, routines and site locations will be selected for appropriateness, and routines will be matched for consistency between sites and group. The NSW National Parks and Wildlife Services grade publicly available walking tracks according to their difficulty (1 to 5, with 5 being the most difficult; please see section 10.5 for further details on this grading). Each selected walk location will be graded between 1-3. Table 3 shows how the walk locations and routines will be matched.

Table 3 - Nature Walking Group schedule - routines and locations (TBC)

Walk/session number	Core routine	Additional routine/s	Site	Walk location (Grade)	Nature characteristics on the walk (e.g. water source, view, textural diversity)
1^	1. Breathe slowly	13. Nature's connections	Orange	Botanic gardens (1)	Textural diversity
			Wollongong	Botanic gardens (1)	Textural diversity
2			Orange		
			Wollongong		
3			Orange		
			Wollongong		
4			Orange		
			Wollongong		
5			Orange		
			Wollongong		
6			Orange		
			Wollongong		
7			Orange		
			Wollongong		
8			Orange		
			Wollongong		
9			Orange		
			Wollongong		
10			Orange		
			Wollongong		
11			Orange		
			Wollongong		
12			Orange		
			Wollongong		

^Example routines and location

5.6 Treatment as usual (Groups A and B)

Participants in Group A will also continue to receive one-on-one support from a clinician of the multidisciplinary team at the ICMHS or LikeMind. Similarly, those in the non-walking group will continue their TAU. The teams at each location consist of psychologists, occupational therapists, nurses, social workers and peer workers. The services work with adults (18-65 years old) experiencing varying mental illnesses to support their mental health recovery goals. These goals might revolve around social inclusion, emotional development and support, and vocational support. The sessions are tailored individually, can be held weekly or fortnightly, and can either be brief or long-term support. Clinician support generally involves the use of motivational interviewing, goal setting, problem-solving, case management and some brief cognitive behavioural therapy (CBT). The services assist consumers to develop greater clarity and understanding of their goals and how to achieve them, increase insight into the impacts of mental illness and have greater awareness of resilience factors and community resources.

6 DATA COLLECTION TOOLS AND PROCEDURES

A variety of quantitative and qualitative data will be collected to explore the experiences and impact of NWGs for the participants.

6.1 Organisational Readiness for Implementing Change (ORIC) survey (Group C)

Prior to commencement of the first NWG, employees at each site will be invited to complete an anonymous online survey on the organisational readiness to implement the NWG (see Appendix 12.14). The ORIC is a valid, reliable 12-item questionnaire that assesses the extent to which organisational members are psychologically and behaviourally prepared to implement organisational change.

6.2 Ethnographic observations (Group A)

A research assistant will participate in the walking groups and take field notes following each group. These observations are crucial because they can contribute knowledge of the setting of each group, participants' behavior during each walk, and reflections on the group content and/or process. In this way, the researcher is a participant observer of the walking groups (Creswell, 2013). The fieldnotes will include detailed descriptions and reflections for each entry and may also include theoretical and methodological observations (Emerson, Fretz, & Shaw, 2011). The Ethnographic Observations Guide is attached (see Appendix 12.9).

6.3 Group Closing Reflective Focus Groups (Group A)

After the last group, participants will be invited to take part in a focus group (2 hours). Additionally, field-notes and audio-recording will be taken during the focus group to document participants' reflection on their journey through the program (see Appendix 12.10 for the focus group guide).

6.4 Facilitator focus group (Group C)

After the Nature Walking Groups have finished the Group C will be invited to participate in a 2-hour focus group. The focus groups will be conducted online on Microsoft Teams. The discussion will be audio recorded and recordings will be professionally transcribed into word documents for analysis. Please see Appendix 12.15 for the focus group questions.

6.5 De-identified site-wide client data

To establish the profile of the site's client population and compare it to those participating in the intervention, the evaluation team will utilise a range of de-identified routinely collected health data.

LikeMind and ICMHS will provide de-identified data to the evaluation team.

Data to be extracted;

- Number of clients serviced and their demographics (including diagnosis)
- Referral source
- Intervention activities – type of intervention (e.g. case management, psychiatry), length of time

engaged with service.

- Aggregated outcome measure results

6.6 Pre, post and 3-month follow-up Surveys (Group A and B)

An online or pen and paper survey (See Appendix 12.6) will be completed by participants in groups A and B at baseline, 12 weeks post-baseline (post NWG) and at 3 post-intervention. The following scales will be included:

Table 4 - Pre, post and 3-month follow-up survey scales

Primary Outcome Measure	The Patient Health Questionnaire for Anxiety and Depression (PHQ-AD) (16 items)
Secondary Outcome Measures	Personal Wellbeing Index (7 items)
	Pittsburg Sleep Quality Index (2 items)
	DeJong Gierveld Loneliness Scale (6 items)
	Nature Relatedness Scale – short form (6 items)
	The Warwick Edinburgh Mental Well Being Scale (7 items)
	Major life event, positive or negative (2 items)
	Connor-Davidson Resilience Scale (2 items)

In addition, participants in the NWG will be asked to report their mood pre- and post-walking session, as described in Section 6.8.

6.7 Pre-post salivary cortisol and DHEA testing (Group A and B)

Cortisol is a widely studied biomarker frequently used as a measure of human stress levels (Adam et al., 2017; Ahmed et al., 2023; Smyth et al., 2020). It is a steroid hormone essential for many vital processes, helping to control metabolism, fight infection, regulate blood glucose, maintain blood pressure, and plays an important role in priming the body to respond to stress. Cortisol is produced by the adrenal glands that sit on top of the kidneys and the amount of cortisol released can be influence by a variety of elements including exercise. Levels follow a daily pattern (the diurnal rhythm), rising in the early morning, peaking about 8 a.m. before falling in the evening (Pathology Tests Explained, 2023).

Dehydroepiandrosterone (DHEA) is an adrenal androgen, a human steroid and precursor to several anabolic steroids, which is co-released with cortisol. The cortisol-DHEA ratio hypothesis maintains that DHEA has a protective function in which it counters elevated cortisol to achieve homeostasis, and hence protects the hippocampus and hypothalamic-pituitary-adrenal axis against the effects of chronic exposure to cortisol. It is considered therefore that high levels of DHEA are a good measure of resilience. A comprehensive review of the literature on cortisol and DHEA levels in mental health monitoring found that quantifying the cortisol-DHEA ratio was important for objectively measuring stress variance between mental health service consumers and healthy individuals (Ahmed et al., 2023).

To ensure accurate measurements, samples should be collected at the same time of day for pre- and post-intervention collections. Saliva samples will be collected from all participants by the site study co-ordinator as per the instructions of the test used (see Section 6.7.1). To reduce the possibility of diurnal changes and other confounding variables it is envisaged that the samples will be collected between 11am and 1pm on three assigned collection days, as follows:

- One week prior to the first walk,
- At the conclusion of the first walk,
- At the conclusion of the final walk (12th walk).

Samples will be provided by participants as per the Salimetrics instructions provided by the Salivary Bioscience Research Centre (see Section 6.7.1). The samples will be identified with the participant's unique code to protect their identity before being securely stored for transportation to a freezer at the Rural Health Research Institute, Orange, and University of Wollongong School of Medicine & Health Nutrition Lab where they will be securely stored until transported as a single batch from each site by transportation recommended by the Salivary Bioscience Research Centre to their laboratory in the School of Psychology at the University of New South Wales, Kensington. Samples remain stable for two hours at 2-8C allowing for transportation on ice in a regular esky from the collection site to the secure freezer at either Orange or Wollongong. Samples must then be kept frozen at -20C until testing as thawing and re-freezing degrades the sample.

6.7.1 Saliva collection procedure via passive drool method

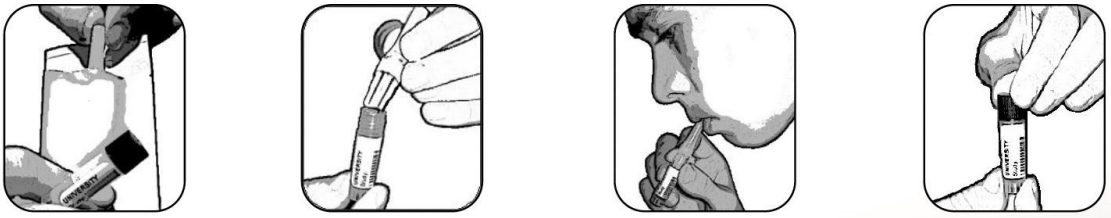
Salivary samples for cortisol and DHEA testing should be collected at the same time of day for all samples.

6.7.1.1 Preparation

1. Ensure the tube is labelled with your unique participant code.
2. Remove lipstick or lip balm and avoid brushing or flossing your teeth for at least 30 minutes prior to collection of saliva.
3. It is best not to eat, drink anything but water, or smoke for at least 30 minutes before providing the saliva sample.

6.7.1.2 Collection

Whole saliva samples will be collected with SalivaBio's 2mL cryovials and the Saliva Collection Aid (exclusively from Salimetrics, State College, PA), a collection device specifically designed to improve volume collection and increase participant compliance, and validated to use with salivary analytes, as per the instructions below.



Step 1:
If packaged, open foil pouch and remove the Saliva Collection Aid (SCA). Otherwise, proceed to Step #2.

Step 2:
Place ribbed-end of the SCA securely into a pre-labeled collection vial *(see Caution 3 above)*.

Step 3:
Allow saliva to pool in mouth. Then, with head tilted forward, **gently** guide saliva through the SCA into the vial. Fill to the required volume.*

Step 4:
Remove and discard SCA. Attach cap to collection vial and tighten.

*NOTE: Reserve a small amount of air space in the vial to accommodate liquid expansion during freezing.

6.7.1.3 Sample handling

- Immediately after collection, freeze samples at or below -20C. If freezing is not possible, refrigerate immediately at 4C and maintain at this temperature for no longer than necessary (ideally less than 2 hours) before freezing at or below -20C (the temperature of a regular household freezer).
- Samples stored for more than 4 months should be frozen at -80C.

6.8 Before and after walk mood scale (Group A)

Visual single item mood scales have been shown to be both simple and quick to administer and have validity equal to other more complex and time-consuming self-rated or observe-rated scales making them a reliable measure for monitoring mood changes during research projects (Gertler & Tate, 2020; Kontou et al., 2012). A visual single item mood scale typically consists of two dichotomous endpoints with a single straight line about 100mm long. The moods at the endpoints are labeled with a numbered scale, each point represented by an emoji (e.g., and). Prior to each walk, the research assistant (social work student TBA), will ask each participant to complete their scale before the walk, and then again after (see Appendix 12.8).

6.9 Phone interviews (Group A)

Individual phone interviews will be conducted with the participants of Group A 3 months after the intervention ends. A semi-structured interview guide will be used (see Appendix 12.11); interviews will be audiotaped and transcribed. The brief interview (15-30min) will explore any longer-term benefits for Group A including if they continued to walk in nature. The interviews will be conducted by the project investigators and/or research assistants.

7 DATA ANALYSIS

A frequentist statistical approach will be adopted for quantitative data analysis, using SPSS or R software. Specifically, analysis of variance will provide objective evidence of the efficacy of the NWG intervention.

7.1 Sample size and power calculation

While sample size calculation is crucial for a pilot study, achieving adequate power through formal calculations can be challenging (Billingham et al., 2013). Nonetheless, we have derived the sample size for this study by considering the estimated effect size observed in the literature for various mental health indicators. According to the conceptual framework of the proposed pilot feasibility trial study, the primary outcome measure was the level of distress measured by Patient Health Questionnaire Anxiety and Depression Scale (PHQ-ADS). In a recent randomized controlled trial study in the UK conducted by Picariello et al. (2024), it was found that the mean level of distress among the study participants was 22.76 (SD, 9.46), which decreased by 30% immediately after the cognitive behavioural therapy intervention. We utilized these study findings to inform the parameters for the sample size calculations in our study. We assumed the mean level of distress will be about 22.76 (with SD, 9.46) among the study participates at baseline in both control and interventions group (Picariello et al., 2024). After the program implementation, the mean level of distress will be reduced to 16.08 (SD, 10.41) among the participants in interventions group (assuming about 30% reduction by the intervention; Picariello et al. (2024). To ensure a minimum detectable difference in the mean distress level between the intervention and control groups at follow-up, with a power of 80% and a 5% level of significance, a minimum sample size of 72 participants is required (36 participants in each group). Anticipating 10% loss to follow-up, we plan to include 80 participants in total. Therefore, data will be collected from at least 40 participants in both the control and intervention groups, enabling to assess the program's effectiveness in improving mental health outcomes. Our planned sample size falls within the range of suggested sample sizes for pilot and feasibility studies as per the guidelines, which recommend 30-59 participants (Billingham et al., 2013; Viechtbauer et al., 2015).

The outcomes will be analysed using a Wilcoxon signed ranks test to calculate change between scores because measures contain ordinal data and a test that does not assume a normal distribution is required. A W-statistic is appropriate for a small number of linked observations.

7.2 Qualitative data analysis

Qualitative data will be analysed using an inductive thematic approach (Guest et al., 2012) and managed through QSR NVivo 12 software. Thematic analysis is theoretically flexible, interpretive, and data driven, which will allow for uncovering the thoughts, perceptions, and feelings of the study participants (Grbich, 2012). The data analysis will focus on participant satisfaction (e.g. What did you like the most about the walking group?) as well as perceived outcomes of their involvement in the nature walking group (e.g. What do you think might be the impacts of the walking group for your mental health and wellbeing?). The team will collaboratively develop a codebook, and two researchers will code all the data sources independently and

compare their results. Additional strategies such as audit trail and member checking via the final data analysis workshop will be used to ensure rigor in our analysis (Meyrick, 2006).

7.3 Member-checking workshop

A group workshop will be conducted by investigators to invite Group A, B and C participants to engage with the data analysis process and clarify the findings thus far. Participants who attend will receive a $50 payment for their time. During this workshop the investigators will engage with the participants in a process called member-checking whereby the participants are invited to provide feedback on the accuracy of the data analysis (McKim, 2023). Specifically, participants will be asked questions along the lines of 'After hearing about the findings, what are your general thoughts?'; 'How accurately do you feel the findings captured your thoughts/experiences?'; 'What could be added to the findings to more accurately capture your experiences?'; 'Is there anything you would like removed from the data, what would that be and why?'

8 DATA MANAGEMENT

Data Storage and Record Retention

The interviews will be audio-recorded and transcribed by professional transcribing services. We will keep the outcome measures, interview audios, interview transcripts and field notes in a Charles Sturt University password-protected one drive for business folder. The interview audio records will be destroyed after 5 years, which is the minimum storage period for University research. Only the researchers and trained and approved research assistants will have access to the data. Only the persons conducting the study or the person typing the information will hear the tape. All data collected from this study will be compiled so that no individual's statements are identifiable. The data will be owned by the Rural Health Research Institute of Charles Sturt University (see Attachment D for data management plan).

9 PROJECT TIMELINES

As shown in Table 5, the project is devised in three phases, 1) establishment, 2) implementation, and 3) analysis and finalisation. The implementation phase of the project will be conducted over eleven months, starting in April 2024 and data collection ceasing in January 2025.

In summary, the establishment phase of the project is as follows; 1) NWG facilitator training, 2) organisational wide readiness survey to be completed by trained NWG facilitators, 3) participant recruitment, project information sessions, screening and obtaining consent from walking and non-walking group participants. The implementation phase consists of 1) the data collection period where quantitative and qualitative is collected (e.g. salivary cortisol-DHEA measures, wellbeing outcome measures (pre- and post- intervention with 3 month follow-up), ethnographic observations, focus groups), and 2) the intervention period, where Group A individuals participate in the NWG. The analysis and finalisation phase comprises 1) the member-checking workshop, 2) data analysis, 3) finalisation of the evaluation and implementation guide, and 4) dissemination activities.

Given variations in weather patterns between the two study sites, the timing of the NWG will vary. Each site will run two separate NWG, each with 10 participants (four groups in total). While there is flexibility in the timing of each group, the timing of data collection will be the same for each group. The timing of the data collection is detailed in Table 6.

Table 5 - Project timelines

		Year/Month																	
		2024												2025					
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Establishment	Facilitator training, recruitment planning		x																
	Organisational readiness survey (C)				x														
	Participant recruitment (site information sessions)				x	x	x	x											
Implementation	Data collection period (A&B)				x	x	x	x	x	x	x	x	x	x					
	NWG intervention period (A)				x	x	x	x	x	x	x								
	Site-wide client data										x								
	Post intervention facilitator focus group (C)											x							
Analysis + finalisation	Member checking workshop (A&B)													x					
	Data analysis (incl. site comparisons)											x	x	x	x				
	Implementation and Evaluation Guide finalised														x				
	On-going dissemination															x	x	x	x

A = NWG group
B = non-walking group
C = NWG facilitators

Table 6 - Timing of data collection for participants (Group A and B)

	Week																									
Data collection	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**
Pre/post salivary cortisol measure (A&B)**		x											x														
Pre/post & 3 month follow-up survey (A&B)	x												x												x		
NWG intervention (A)^		x	x	x	x	x	x	x	x	x	x	x	x														
Group closing reflective focus group (A)													x														
Post intervention phone interviews (A)														x													

A = NWG group

B = non-walking group

C = NWG facilitators

**Three measures of cortisol; one week prior to the first walk, at the conclusion of the first walk and at the conclusion of the final, twelfth walk

^Ethnographic observations, before and after mood scale

10 ETHICAL CONSIDERATIONS

10.1 Recruitment and Selection of Participants

Participants will be recruited through the existing caseloads of ICMHS and LikeMind, offering participation to any interested person, capping the number at ten for each NWG. Participants in the research will continue receiving the usual one-on-one support throughout the duration of the research. Participants will be recruited in March-April 2024, with the aim of beginning the NWG sessions at the end of April 2024 and concluding the first group in July 2024. The second group will commence in each site in approximately September, concluding in November. Start and finish dates may vary in each site depending on numbers of participants recruited and weather (too hot or cold). Consumers will be informed about the project by staff of the services. If they express an interest in participating, they will be provided with an information sheet and invited to a NWG information session facilitated by the research team. Consumers who are not interested in participating in the walking groups will also be invited to the study to be part of Group B. Consumers who are interested in participating in Group B will be invited to an information session facilitated by the research team where the study and data collection requirements will be explained, information sheets will be provided and consent to participate sought from volunteers. Potential participants who are unable to attend the information day will have a time organised to meet individually with one of the research team at the study site or via a phone call.

10.2 Risk of coercion

The consumers at both sites will receive clinical support regardless of their desire to participate in the research. Therefore, participation in the research is completely voluntary and will not affect their access to mental health support with their usual clinician. This will be made clear in the information sheet and in discussions with interested consumers prior to seeking consent.

10.3 Informed consent

The consent form includes information about the potential benefits of the research, confidentiality, and privacy protections of the study including that the data resulting from participation may be made available to other researchers in the future for secondary data analysis purposes. In these cases, the data will contain no identifying information that could associate participants with it. Participants may consent to participate or not in the study without any consequences. They will be also informed that they can withdraw from the study at any time without repercussions. Participants will be informed that after they sign and return the consent form, it will be retained by the researcher. Participants will be provided with a copy of the Participant Information Sheet (see Appendix 12.3).

The text of the informed consent (see Attachment 12.3 for the full document) includes:

- Participation in this project is voluntary, and consent to be involved in the study can be withdrawn at any time.
- Any consumers not wishing to participate in the walking groups will be offered an option to participate in Group B (non-walking group). These participants would only provide survey data and optional saliva samples.
- Participants may decide not to participate, choose not to answer any question, or stop participating at any time without any penalty.
- They will be informed that if they want to withdraw from the project, they can simply stop participating.
- Participants' real names will not be used at any time.
- There is a small risk of physical injury to participants in the walking group as the research requires participants to be physically active. Specific walking routes (grades 1-3) will be chosen to lessen the likelihood of trips and falls occurring.
- There is no cost or compensation for participation in the walking groups or control groups. However, participants will be reimbursed for their time spent completing measures as per the following:
    - Baseline survey [Groups A and B] $50
    - Post-intervention survey [Groups A and B] $50
    - Follow-up survey [Groups A and B] $50
    - Saliva – 3 samples @ $20 each [Groups A and B] $60
    - Post intervention phone interview [Group A] $40
    - Member-checking workshop [Group A and B] $50
- Participants will be informed that they can ask questions at any time and will be provided with the contact information of the research team.
- Participant's decision whether to participate in the research study will have no impact on the participants' treatment or involvement with ICMHS or LikeMind, the Rural Health Research Institute, Charles Sturt University or the University of Wollongong.

10.4 Confidentiality and Privacy

All participants in the research study will sign a statement of informed consent. After they sign and return the consent form, it will be retained by the researcher. Participants will be told during recruitment and prior to beginning the study that they can maintain control over the extent, timing and circumstances of what they share during data collection. Participants will also be told that the information shared will be kept confidential, they will not be identified in research results reported, and their information will not be divulged to others in ways that are inconsistent with the understanding of the original disclosure. The information obtained will only be presented in the aggregate.

In reviewing the consent, the researcher will explain any complicated topics, the limits of confidentiality, will make sure that the respondent understands the content of the consent, and will address any questions or concerns that the participants have about the consent and/or about audio-taping prior to obtaining signatures. The researchers will make clear that if the respondent decides that they are uncomfortable with the study as presented in the consent, they can withdraw from the study at any point. The interviews will take place over the phone, so as to ensure convenience and comfort for the participants.

Each participant will be assigned a 2-digit numerical code which will be used to identify the interviews. ICMHS will use codes between 01–50 and LikeMind will use codes between 51–99. All data will be used in aggregate fashion and there will be no mention of participants' real names. Participants will be de-identified in the audio transcripts and in subsequent research dissemination activities such as presentations and publications.

10.5 Safety

There is a potential for participants to become mentally unwell and/or physically unwell during the research. Firstly, the potential for mental health consumers to become acutely mentally unwell is an ever-present issue, however, it is mediated through a complex network of the person's personal coping strategies, their daily routine, social network, and professional medical care. The risk of exacerbation of an acute episode as a direct cause of the research would be considered low, as current research suggests that both physical exertion and experiencing natural environments are stress-relieving rather than inducing. The stress-relieving benefits of engaging with the natural environment have already been discussed and outlined.

As the research requires participants to be physically active, there is a small risk of physical injury. Specific walking routes will be chosen to lessen the likelihood of trips and falls to occur. The NSW National Parks and Wildlife Services offer a grading system for the community to select trails that are suited to their needs, outlined as follows:

- Grade 1 is defined as "No bushwalking experience required. Flat even surface with no steps or steep sections."
- Grade 2 is described as "No bushwalking experience required. The track is hardened or compacted surface and may have a gentle hill section or sections and occasional steps."
- Grade 3 is described as "Suitable for most ages and fitness levels. Some bushwalking experience recommended. Tracks may have short steep hill sections, a rough surface and many steps."
- Grades 4 and 5 require moderate or skilled bushwalking experience.

As a result, all routes chosen in the research will be comprised of Grades 1 to 3.

COVID-19 safety plan will be completed and approved prior to the starting of the group. The plan will depend on the COVID-19 NSW restrictions in place at the time when the group is to be launched. If no groups are allowed to gather, the project will be postponed until the restrictions are lifted.

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