

Cycling Without Age: Assessing the Impact of a Cycling-Based Initiative on Mood and Wellbeing

Objective: Cycling Without Age is a global initiative in which trained volunteers take adults living in care homes or supported housing environments out on specially designed trishaws. Despite its global success, there is no peer-reviewed research on the effect the initiative has on the older adults taking part. The current study therefore assessed changes in mood and wellbeing to determine whether there were short-term benefits of participation.

Methods Forty-nine older adults (69% female; 67-100 years old (M=84.1, SD=7.6)) living in care homes and supported housing environments were recruited; 35 participants completed all measures and comprise the analytical sample. Participants completed the Warwick-Edinburgh Mental Wellbeing Scale and UWIST Mood Adjective Checklist immediately before a ride (baseline); they repeated the measures on completion of the ride (follow-up). Participants also completed baseline and follow-up measures on a day in which they did not go on a ride. Repeated measures ANOVA compared differences in baseline and follow-up mood and wellbeing scores on ride and no ride days.

Results: For all mood and wellbeing measures, there were significant interactions between day (ride or no ride) and measurement occasion (baseline or follow-up). Analyses revealed significant improvement in the mood and wellbeing at follow-up on ride days, versus no ride days.

Conclusions: Short-term positive changes in mood and wellbeing were reported as a result of participation in the CWA initiative for older adults in care home and supported living environments. Further research is needed to explore the longevity of benefits and longer-term changes.

Keywords: mood, wellbeing, interventions, care home, supported living

Introduction

Cycling Without Age (CWA) is an innovative activity in which trained volunteers take people out on specially designed trishaws to explore their local areas and communities (Figure 1). Those taking part in the initiative are predominantly older adults living in long-term residential homes, many of whom have mobility and/or cognitive impairments that can limit their independence (Gow, Bell, & Biggar, 2019). Since its inception in Copenhagen in 2012, CWA has expanded to over 50 countries (Cycling Without Age, 2020). Despite CWA's global success, limited research has examined the benefits of the initiative. The current study therefore examined the immediate impact that engaging with the CWA activity has on older adults' mood and wellbeing.

<Insert Figure 1 about here>

A mixed methods approach found three common themes that older care home residents participating in the initiative in Wisconsin appreciated about CWA: fresh air, socialising and relaxing (McNeil & Westphal, 2017). A quantitative follow-up study revealed that after four months of participation (2 rides per week), older adults displayed significant improvements in mental wellbeing (McNeil & Westphal, 2017). Similarly positive results have also been reported in relation to self-reported quality of life; for example, following a 12-week intervention programme in Barcelona in which participants took part in regular trishaw rides, there was a significant improvement in quality of life. Participants placed particular emphasis on the relationship that had been built with their CWA pilot (Salas, 2018). Although both the Wisconsin and Barcelona findings are positive and highlight the benefits of CWA, neither studies employed a comparison in which people who did not take part in the activity were measured.

CWA was introduced in Scotland by the Communities Along the Carron Association (Gow, Bell, & Biggar, 2019). During an initial trial in one town (Falkirk), qualitative research

consisting of focus groups and interviews with care home residents, staff, CWA volunteers and family members/carers were conducted. Consistent with the research from other CWA locations (McNeil & Westphal, 2017; Salas, 2018), findings suggested benefits for care home residents in relation to a sense of freedom, enjoyment of fresh air and social interaction (Gow, Bell, & Biggar, 2019). Staff and family members also identified benefits in terms of mood, alertness and general wellbeing. Following the successful trial, Cycling Without Age Scotland was formed with support from the Scottish Government to enable the formation of CWA chapters nationwide.

In view of the lack of peer-reviewed research specific to CWA, it is useful to examine research related to the elements the initiative seeks to provide. These are predominantly access to outdoor spaces and socialisation, both of which have been highlighted by older adults in qualitative reports (McNeil & Westphal, 2017; Salas, 2018; Gow, Bell, & Biggar, 2019). Firstly, the importance of socialisation for older people living in long-term care homes appears to be vital in maintaining or enhancing positive mood and wellbeing. A recent survey found that the greatest predictor of positive wellbeing in care homes was the number of friends within the residence (Wolff, 2013). There may be several reasons for this, but one that is common in the literature, and something that CWA highlights in their principles, is the act of reminiscing. Following a six-week intervention study in which participants were placed in either a group reminiscence activity, individual reminiscence, or control group (playing skittles), there was a significant main effect of group; those in the reminiscence group (and control group) experienced significant improvements in wellbeing, with group reminiscence showing the most marked improvements (Haslam, et al., 2010). It has been suggested that in care homes, thinking about the past was far more frequent than talking about it. Reminiscence was commonly used to escape boredom and loneliness, though these residents were most likely to think about bitter memories. Those who displayed more depressive symptoms

reminisced in a ruminative fashion, thinking more about lost loved ones (Henkel, Kris, Birney, & Krauss, 2016). The evidence highlights the need for facilitated reminiscing and to keep residents active so as to avoid negative forms. Arguably, CWA presents a way to achieve this by offering care home residents the chance to explore areas together that are likely to encourage memories, while being accompanied by a trained volunteer. Pilots are not necessarily trained to encourage reminiscence as training focusses on health and safety, although qualitative reports suggest that pilots and riders talk to one another throughout, regularly about the 'back story' of the participant (Gow, Bell, & Biggar, 2019). Further evidence also supports the positive impact socialising within volunteer schemes have on the wellbeing of older adults (Hill, 2016).

As the CWA mantra 'the right to wind in your hair' suggests, another key element is access to outdoor spaces, the importance of which is evident in the wider literature. Care home residents place a high value on outdoor spaces being accessible, with the need to be around greenery of particular importance (Kearney & Winterbottom, 2008). Lack of access to outdoor spaces has also been reported as the main environmental variable predicting depressive symptoms in care home residents (Potter, Sheehan, Cain, Griffin, & Jennings, 2018). Despite this, there are several barriers such as physical limitations, lack of assistance and design issues that prevent residents from enjoying the outdoor environment. When these barriers are overcome even for a short while, there appears to be a positive impact on health and wellbeing (Astles, 2013; Dahlkvist, et al., 2016). In people at different stages of dementia, significant improvements in agitation and sleep, as well as general wellbeing, were reported as a result of supported access to outdoor spaces. This was even the case for simple garden usage (Heliker, Chadwick, & O'Connell, 2001; Whear, et al., 2014). The frequency of access to outdoor spaces has been associated with feeling more cheerful and alert, as well as

improvements in emotional well-being and the alleviation of some depressive symptoms (Rappe & Linden, 2005).

The current study explored short-term changes in the mood and wellbeing of older adults as a result of participation in the CWA activity. As CWA includes elements of socialisation and access to the outdoors, both suggested to have benefits in terms of wellbeing and mood for older adults in care settings, we predicted that participation in the CWA initiative would be associated with significant immediate improvements in mood and wellbeing.

Methods

Participants

Participants were only included in the study if they were able to provide informed consent. Care home staff provided guidance on residents who would be unlikely to provide this, or be unable to complete the relevant measures, including participants who would only be able to respond to questions with yes/no rather than using the fuller response options. Participants were included, however, if they were able to respond to the questions but needed some support in physically completing them (for example, should they have difficulty with writing, holding a pen, etc). Forty-nine older adults were recruited from across Scotland within areas where the CWA scheme was active; 20 lived in supported housing, with the other 29 participants residing in long-term care home facilities. The group consisted of 34 females (69% of the sample) and 15 males aged 67 to 100 years old ($M=84.1$, $SD=7.6$). Participants varied in how long they had been in their respective living environments, as well as the number of CWA rides they had taken prior to the study; for example, two participants had lived in their care home or supported housing residence for two months, whereas two had been residents for 23 years ($M=41.6$ months, $SD=91.8$). In terms of their prior involvement with CWA, most participants ($n=44$) had taken fewer than 10 rides; however, there was wide

variation within this as nine had never previously participated in the scheme, and one resident had taken as many as 50 rides before participating in the current study ($M=3.8$ $SD=7.5$). All participants from care home environments ($n=29$) lived with restricted mobility and/or some form of cognitive impairment. Participants in supported housing ($n=20$) were more independent, for example they were not living with cognitive impairments, and those with mobility issues were not yet at a stage where full-time care was required.

Materials

The Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS): The Warwick-Edinburgh Mental Wellbeing Scale (Tennant, et al., 2007) consists of 14 items measuring hedonic and eudaimonic aspects of mental wellbeing. The measure covers positive affect (feelings of optimism, cheerfulness and relaxation), satisfying interpersonal relationships and positive functioning (energy, clear thinking, self-acceptance, personal development, competence and autonomy). Participants are required to tick the box that best describes their experience of each statement using a five-point Likert scale (none of the time, rarely, some of the time, often, all of the time). The overall score is calculated by totalling the responses for each of the statements, ranging from 14-70. A higher score on the WEMWBS indicates a higher level of wellbeing.

The UWIST Mood Adjective Checklist (UMACL): The UWIST Mood Adjective Checklist (Matthews, Jones, & Chamberlain, 1990) consists of 24 adjectives describing mood. The adjectives are grouped into three mood factors (Hedonic Tone, Tense Arousal and Energetic Arousal) with 8 adjectives in each subscale. Hedonic Tone is characterised by the balance between feelings of pleasantness or unpleasantness, Tense Arousal ranges from states of anxiety to states of calmness, and Energetic Arousal is characterised by feelings ranging from vigour to fatigue. Participants are required to tick the response that best describes their momentary feelings using a four-point Likert scale (Definitely not, slightly not, slightly,

definitely) with factor scores ranging from 8-32. A higher score in each scale indicates higher levels of that factor.

Procedure

The study adopted a repeated-measures design in part due to the difficulties of recruitment within care homes and also so that participants provided both ‘active’ data and data for comparison (essentially each participant acted as their own control). This is advantageous in studies in real-world settings, as no participant is excluded from receiving the active condition during the study.

All participants were recruited by contacting residential homes and supported housing units via CWA Scotland. The care homes who were interested in taking part then contacted The Ageing Lab at Heriot-Watt University directly to arrange a suitable time for the researcher to visit the site and introduce the study to the residents. Residents who volunteered to take part in the study after this meeting were given an information sheet detailing the procedure. All introductions (and subsequent completion of measures) took place within the participants’ residence so that a trained support network would be present.

After providing written, informed consent, participants were asked to provide their age, gender, length of residence to date, and how many CWA rides they had been on prior to the study.

Participants were required to complete the Warwick-Edinburgh Mental Wellbeing Scale (Tennant, et al., 2007) and the UWIST Mood Adjective Checklist (UMACL) (Matthews, Jones, & Chamberlain, 1990). This was done by either providing a hard copy of the measures for participants to complete themselves, or by the researcher or a member of staff who read out the questions and statements, so that participants could verbally provide their answers. Once completed, participants were left to continue their usual routine for approximately 60 minutes, though this varied depending on the home and staff requirements.

Participants were then asked to complete the WEMWBS and UWIST again. These measures comprised the “No Ride Day” baseline and follow-up scores respectively.

On the next visit, participants were asked to complete the WEMWBS and UWIST before going out on a CWA ride. Upon completion of their ride, which usually lasted 40-60 minutes, participants were asked to complete both measures again. These measures comprised the “Ride Day” baseline and follow-up scores respectively. The study was approved by the School of Social Sciences Ethics Committee at Heriot-Watt University.

Statistical Analyses

The data satisfied the assumptions for parametric testing. Separate mixed analyses of variance (ANOVA) were conducted for the WEMWBS and each of the UMACL factors, using SPSS. For all ANOVA, 35 participants provided data at baseline and follow-up on both ride and no ride days. The ANOVA assessed the main and interaction effects of the within-subjects factors Day and Baseline/Follow-up. Age (grouped as below 85 and 85 and above) and gender were included as between-subject factors. Where significant interactions were observed, post-hoc analyses were conducted with alpha set at .0125 to correct for multiple comparisons.

Results

Dropout

Of the 49 participants who consented to the study and provided demographic information, 47 completed No Ride Day measures and 35 completed Ride Day measures. Reasons for dropout between No Ride and Ride Days were predominantly health-related: 5 participants were subsequently too unwell to take part in a ride, 1 was admitted to hospital, and 1 participant died. Other reasons included people not wanting to participate in a ride on days coinciding with researcher visits (n=2) and care homes being unable to accommodate the research due to unforeseen circumstances (n=3). See Table 1 for the differences in

demographic and baseline mood and wellbeing scores between the 35 participants who completed the study versus the 12 who dropped out after No Ride Day measures.

<Insert Table 1 about here>

Warwick Edinburgh Mental Wellbeing Scale (WEMWBS)

Figure 2a displays the wellbeing scores for No Ride and Ride Days. The WEMWBS mixed ANOVA revealed a significant interaction between Day and Baseline/Follow-up [$F(1, 32) = 12.29, p = .001$], as shown in Table 2. No significant interaction effects were found for the between-subject factors of age and gender (Table 2). Simple effects analyses indicated that there was no significant difference in wellbeing scores between baseline and follow-up wellbeing scores on the No Ride Day [$F(1, 32) = .003, p = .955$]. However, there was a significant improvement in wellbeing scores from baseline to follow-up on the Ride Day [$F(1, 32) = 26.28, p = .001$]. There was also a significant difference between the follow-up wellbeing scores on No Ride versus Ride Days [$F(1, 32) = 30.161, p = .001$] but not between the baseline scores [$F(1, 32) = 5.42, p = .027$]. Overall, therefore, the results suggested no baseline differences in wellbeing, but that scores improved after taking part in a ride (versus remaining stable on days with no ride).

<Insert Table 2 about here>

<Insert Figure 2 about here>

Hedonic Tone (UMACL)

Figure 2b displays the Hedonic Tone scores for No Ride and Ride Days. The mixed ANOVA revealed a significant interaction between Day and Baseline/Follow-up [$F(1, 32) = 18.48, p = .001$] and between Baseline/Follow-up and Gender [$F(1, 32) = 7.03, p = .013$] (Table 2). The simple effects analysis suggested no significant difference between the baseline and follow-up Hedonic Tone scores on the No Ride Day [$F(1, 32) = 1.83, p = .186$], whereas scores significantly improved from baseline to follow-up on the Ride Day [$F(1, 32) = 27.57,$

$p=.001$]. There was also a significant difference between the follow-up Hedonic Tone scores on No Ride versus Ride Days [$F(1, 32) = 29.03, p=.001$] but not the baseline scores [$F(1, 32) = 0.18, p=.733$]. In terms of the Baseline/Follow-up by gender interaction, the simple effects analysis revealed that females' Hedonic Tone significantly improved from baseline to follow-up overall [$F(1, 32) = 37.41, p=.001$], whereas males' scores did not [$F(1, 32) = 0.45, p=.505$].

Tense Arousal (UMACL)

Figure 2c displays the Tense Arousal scores for No Ride and Ride Days. The mixed ANOVA revealed a significant interaction between Day and Baseline/Follow-up [$F(1, 32) = 21.82, p=.001$]. The simple effects analysis suggested no significant difference between the baseline and follow-up Tense Arousal scores on the No Ride Day [$F(1, 32) = 3.52, p=.70$]; however, there was a significant improvement from baseline to follow-up on the Ride Day [$F(1, 32) = 18.26, p=.001$]. Again, there was no significant difference between the baseline scores across days [$F(1, 32) = 0.16, p=.691$] but there was a significant difference between the follow-up scores [$F(1, 32) = 18.26, p=.001$].

Energetic Arousal (UMACL)

Figure 2d displays the Energetic Arousal scores for No Ride and Ride Days. The mixed ANOVA revealed a significant interaction between Day and Baseline/Follow-up [$F(1, 32) = 7.57, p=.010$] and Day, Baseline/Follow-up and Gender [$F(1, 32) = 4.95, p=.033$]. The simple effects analysis suggested no significant difference between baseline and follow-up scores on the No Ride Day [$F(1, 32) = 0.22, p=.640$] but a significant improvement from the baseline to follow-up on Ride Days [$F(1, 32) = 13.91, p=.001$]. No significant difference was found between the baseline scores across days [$F(1, 32) = 3.16, p=.085$] but there was a significant difference between follow-up scores [$F(1, 32) = 16.57, p=.001$]. Analysis of the 3-way interaction revealed that females' follow-up scores were significantly different on each

day [$F(1, 32) = 27.68, p = .001$] and that their baseline and follow-up scores were significantly different [$F(1, 32) = 36.23, p = .001$].

Discussion

The current study highlights the immediate positive impact that participation in the CWA activity has on the mood and wellbeing of older adults living in care home and supported housing environments. Participants' mental wellbeing, feelings of pleasure, and energy levels were significantly higher after they had taken a trip on the trishaw, while their stress levels were reduced. On days with no CWA ride, the mood and wellbeing measures remained stable over a period of time similar to that involved in a ride. Overall, the findings are consistent with the available literature specific to CWA, which also highlights the positive impact the initiative has on the mental wellbeing of older adults (McNeil & Westphal, 2017; Salas, 2018; Gow, Bell, & Biggar, 2019).

There is an important caveat when studying this kind of real-world intervention, which is the difficulty in breaking the activity down into the component parts that might be proposed as underlying those positive changes, and therefore measuring which specific factor influences mood and wellbeing, or whether it is the combination of factors. It is therefore important to note these findings should not be overstated, despite the evidence suggesting that the activity has a significant immediate effect on mood and wellbeing. Nevertheless, the qualitative data specific to CWA, and particularly CWA Scotland (Gow, Bell, & Biggar, 2019), suggests that older adults in care homes view socialisation and access to the outdoors as being the most important elements of the activity; the findings will therefore be discussed in relation to those factors.

It is difficult to attribute the potential impact of the socialisation aspect due to the fact that the researcher was not present for the trishaw rides, and no measures of social contact were taken (on either day). Socialisation is, however, a key principal within the CWA

initiative and the findings in the Scotland trial noted that care home residents highlighted how much they appreciated the element of socialisation (particularly with the pilot). The findings are in line with other research that points toward the positive impact of volunteer schemes on the wellbeing of older adults (Hill, 2016) and also the impact that forming new friendships has on the perspectives of those living in residential care (Lester, Mead, Graham, Gask, & Reilly, 2012).

As stated above, lower access to outdoor spaces has been highlighted as a predictor of depressive symptoms in older adults living in care homes (Potter, Sheehan, Cain, Griffin, & Jennings, 2018), as well as a lack of environmental mastery (Knight, Davison, & McCabe, 2011). Participants' significant improvement in mood and wellbeing immediately after getting outdoors and exploring their local communities is supported by a large body of literature that identifies the importance of fresh air, and particularly the positive effects of access to, or viewing of, green spaces (Gagliardi & Piccinini, 2019; Kearney & Winterbottom, 2008; Astles, 2013; Dahlkvist, et al., 2016; Rappe & Linden, 2005). The participants in the current study were generally located in towns and villages in Scotland, meaning that trishaw rides often included easy access to green spaces. An avenue for future CWA research to explore would be whether there is any difference in the mood and wellbeing scores between older adults in CWA locations embedded in cities versus those in more rural areas. That would allow a more fine-grained sense of whether just being outdoors, versus being within green spaces, underpins the changes in mood and wellbeing observed.

Although not significantly different, the baseline scores on the WEMWBS, and the Energetic Arousal and Hedonic Tone factors of the UWIST were higher on days including a ride than those with no ride. This could suggest that the knowledge of a prospective CWA ride may have a positive impact on the wellbeing and energy levels of older adults in care homes, though a larger sample size would be required to explore that in more detail. Other

research has found that positive prospective imagery can significantly influence the mood of older adults (Murphy, O'Donoghue, & Drazich, 2019) and so it may be that a similar mechanism is at play here.

Limitations & Future Directions

The current study has a few limitations. Firstly, the sample size is small but considering that limited research has been done with the initiative, the current study provides a basis for further exploring the potential benefits in more detail. That said, given the sample comprised older adults predominantly living in care homes or supported environments, there were challenges to recruitment. To counter that, the repeated measures design was employed in the current study; future studies might consider a comparison of participants who are actively involved in the CWA initiative versus those that are not, for example.

As mentioned above, there are difficulties in measuring the individual components of a real-world activity such as this, though future CWA research should perhaps focus on attempting to compare the differing impacts of socialisation and access to outdoors separately, as well as comparing this with the combination of the two. That will be complicated by not wishing to interfere with people's access to the initiative. Future research should also compare mood and wellbeing changes between those with specific cognitive impairments, physical limitations or combinations of both. Furthermore, this study only focused on the immediate, or short-term, impact that the CWA ride had on mood and wellbeing. Although this approach is advantageous in real-world settings, it was also part of a planned strategy of building an evaluation of CWA within Scotland over time. The current study is the second stage of this evaluation, further extending the qualitative report conducted by Gow, Bell and Biggar (2019). The next step would be to continue to explore these short-term benefits and assess the longevity of these effects. This would include measuring mood and wellbeing later on the same day as the ride, and also measuring the long-term impacts of participation with CWA

over a course of months, for example. Future research should also aim to explore the wider impacts of CWA, including the measurement of the possible relationships with other aspects of mental health, social isolation and loneliness, and cognitive and physical abilities, as well as a deeper understanding of the experiences of taking part in the scheme, for example including audio or video recording during participation for qualitative analysis.

Conclusion

The current study provides an insight into the effects of a novel initiative aimed at improving the lives of older adults in care home and supported housing environments. This research provides useful findings in terms of the immediate impacts of the CWA initiative, and supports the implementation of the scheme more widely. There is a relationship between participation in this activity and positive short-term changes in mood and wellbeing that should be explored further, including the assessment of possible cognitive and physical changes.

Ethical approval

The study was approved by the School of Social Sciences Ethics Committee at Heriot-Watt University.

Funding

The current study was supported by funding from the Scottish Government, disbursed via Cycling Without Age Scotland (CWAS). The sponsor (CWAS) played no role in designing, executing, analysing and interpreting the data, or writing this paper; CWAS facilitated contact with care homes/supported housing environments, but not participant recruitment.

Author contributions

Removed from masked version.

Conflict of interest

The authors declare no conflicts of interest.

Acknowledgments

Removed from masked version.

References

- Astles, B. L. (2013). *The Impact of Outdoor Environments on Health and Well-being of Residents in Long-term Care Facilities: A Review of the Literature (Unpublished Master's thesis)*. Ontario, Canada: University of Waterloo.
- Cycling Without Age*. (2020). Retrieved from <https://cyclingwithoutage.org/>
- Dahlkvist, E., Hartig, T., Nilsson, A., Hogberg, H., Skovdahl, K., & Engstrom, M. (2016). Garden greenery and the health of older people in residential care facilities: a multi-level cross sectional study. *Journal of Advanced Nursing*, 2065-2067.
- Gagliardi, C., & Piccinini, F. (2019). The use of nature – based activities for the well-being of older people: An integrative literature review. *Archives of Gerontology and Geriatrics*, 315-327.
- Gow, A. J., Bell, C., & Biggar, J. (2019). *Cycling Without Age Evaluation Report 2018*. Edinburgh.
- Haslam, C., Haslam, S. A., Jetten, J., Bevins, A., Ravenscroft, S., & Tonks, J. (2010). The social treatment: the benefits of group interventions in residential care settings. *Psychology and Aging*, 157-167.
- Heliker, D., Chadwick, A., & O'Connell. (2001). The Meaning of Gardening and the Effects on Perceived Well Being of a Gardening Project on Diverse Populations of Elders. *Activities, Adaptation & Aging*, 35-56.
- Henkel, L. A., Kris, A., Birney, S., & Krauss, K. (2016). The functions and value of reminiscence for older adults in long-term residential care facilities. *Memory*, 425-435.
- Hill, M. (2016). *Evaluation of the Volunteering in Care Homes*. U.K.: Institute for Volunteering Research.
- Kearney, A. R., & Winterbottom, D. (2008). Nearby Nature and Long-Term Care Facility Residents. *Journal of Housing For the Elderly*, 7-28.
- Knight, T., Davison, T. E., & McCabe, M. P. (2011). Environmental Mastery and depression in older adults in residential care. *Ageing & Society*, 870-884.
- Lester, H., Mead, N., Graham, C. C., Gask, L., & Reilly, S. (2012). An exploration of the value and mechanisms of befriending for older adults in England. *Ageing & Society*, 307-328.
- Matthews, G., Jones, D. M., & Chamberlain, A. G. (1990). Refining the measurement of mood: The UWIST Mood Adjective Checklist. *British Journal of Psychology*, 17-42.
- McNeil, P., & Westphal, J. (2017). *Cycling Without Age*. Wisconsin: Retrieved from <file:///H:/Cycling%20Without%20Age/Lit%20List%20CWA/Relevant%20PDF/Wisconsin%20Trial.pdf>.
- Murphy, S., O'Donoghue, C., & Drazich, C. (2019). The use of nature-based activities for the well-being of older people. *Archives of Gerontology and Geriatrics*, 315-327.
- Potter, R., Sheehan, B., Cain, R., Griffin, J., & Jennings, P. A. (2018). The Impact of the Physical Environment on Depressive Symptoms of Older Residents Living in Care Homes: A Mixed Methods Study. *The Gerontological Society of America*, 438-447.
- Rappe, E., & Linden, L. (2005). Effects of garden visits on long-term care residents as related to depression. *HortTechnology*, 298-303.
- Salas, K. (2018). *Impact of "Cycling Without Age" on the health of the elderly*. Barcelona: Retrieved from: <file:///H:/Cycling%20Without%20Age/Lit%20List%20CWA/Relevant%20PDF/Karla%20Salas%20Impact%20study%20on%20health%20benefits%20and%20well%20being.pdf>.
- Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S., . . . Stewart-Brown, S. (2007). The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation. *Health and Quality of Life Outcomes*.

- Whear, R., Coon, J. T., Bethel, A., Abbott, R., Stein, K., & Garside, R. (2014). What Is the Impact of Using Outdoor Spaces Such as Gardens on the Physical and Mental Well-Being of Those With Dementia? A Systematic Review of the Quantitative and Qualitative Evidence. *JAMDA*, 697-705.
- Wolff, F.-C. (2013). Well-Being of Elderly People Living in Nursing Homes: The Benefits of Making Friends. *International Review for Social Sciences*, 153-171.

Legends

Figure 1: Cycling Without Age trishaws out on a ride, each piloted by a volunteer (seated at the rear) with up to two passengers seated up front



Figure 2 (a-f): Changes in baseline and follow-up mood and wellbeing scores on ride and no ride days. This includes the significant interaction effects for gender.

a) Warwick-Edinburgh Mental Wellbeing Scale

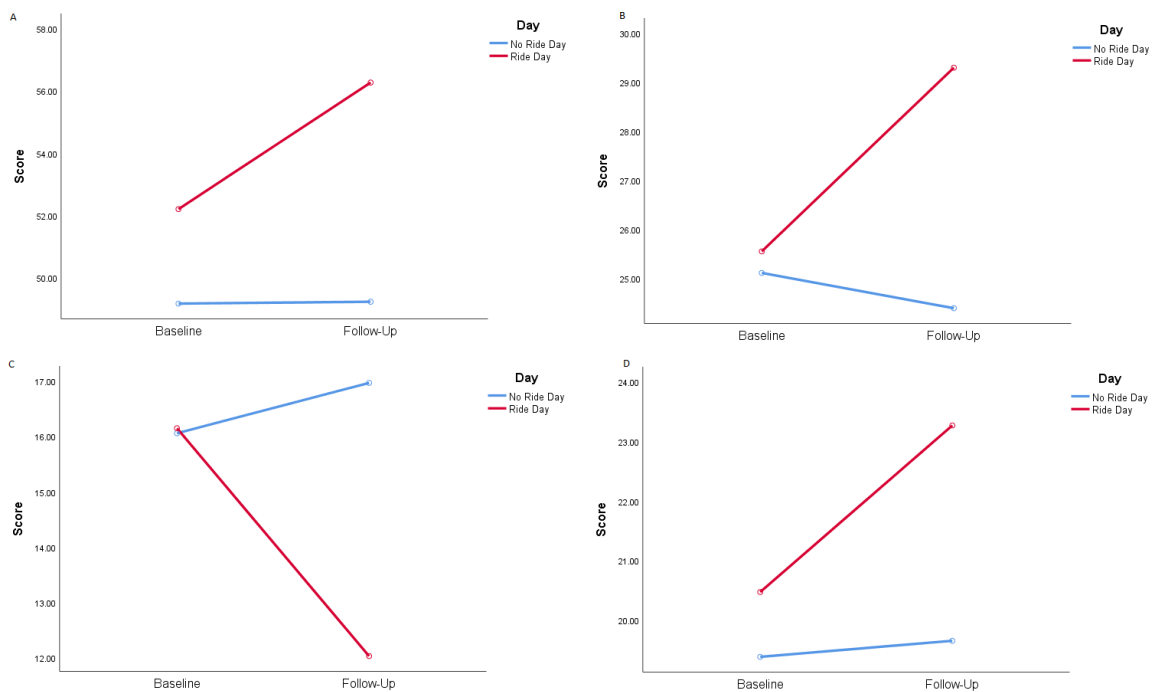
b) UWIST Hedonic Tone

c) UWIST Tense Arousal

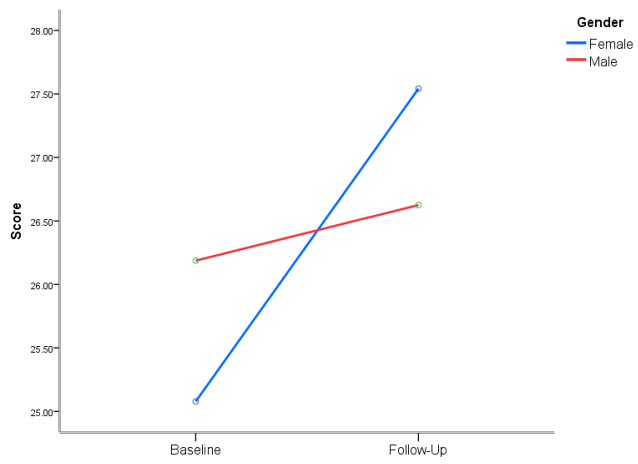
d) UWIST Energetic Arousal

e) UWIST Hedonic Tone (Baseline/Follow-Up*Gender)

f) UWIST Energetic Arousal (Day*Baseline/Follow-Up*Gender)



e)



f)

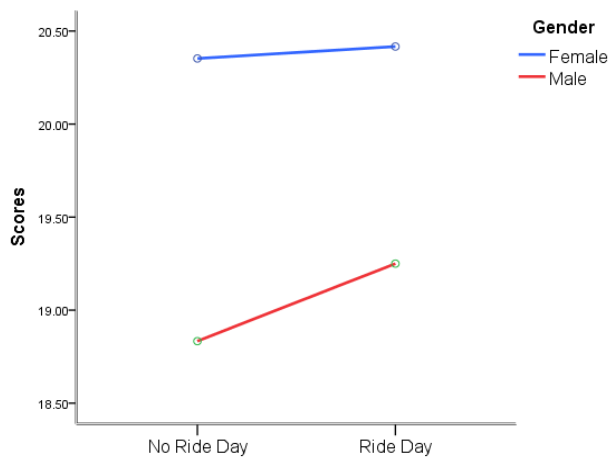


Table 1: Demographics and baseline mood and wellbeing scores

	Total Sample (n=47)	Completers (n=35)	Dropout (n=12)	Welch's t-test	
				t (p-value)	Effect Size
Age	84.0 (7.6)	84.5 (8.1)	82.8 (6.2)	0.63 (.478)	0.22
Gender (% Female)	68%	71%	58%	.401 (Chi- squared)	-0.12
No. of previous CWA rides	3.8 (7.5)	4.3 (8.5)	2.3 (3.3)	0.82 (.417)	0.32
WEMWBS	49.2 (11.0)	49.2 (12.1)	49.2 (6.9)	0.03 (.987)	0.01
Hedonic Tone	25.3 (5.2)	25.0 (5.2)	25.9 (5.4)	0.50 (.624)	0.16
Tense Arousal	16.4 (5.0)	16.4 (5.6)	16.3 (3.1)	0.05 (.942)	0.02
Energetic Arousal	19.5 (4.5)	19.8 (4.7)	18.7 (4.1)	0.75 (.431)	0.26

Note: WEMWBS=Warwick Edinburgh Mental Wellbeing Scale.

Table 2: Two-Way Mixed ANOVA for mood and wellbeing (N = 35).

Descriptives			ANOVA			
Day	Time	M (SD)	Variables	F	p-value	
WEMWBS	No Ride	Baseline	49.2 (12.1)	Day	19.40	.001
		Follow-Up	49.1 (11.3)	Pre/Post	9.98	.004
				Day*Pre/Post	12.29	.001
	Ride	Baseline	52.2 (10.0)	Day*Gender	.042	.838
		Follow-Up	56.3 (9.9)	Pre/Post*Gender	.024	.879
				Day*Age	.061	.807
				Pre/Post*Age	.382	.541
				Day*Pre/Post*Gender	.154	.698
		Day*Pre/Post*Age	1.11	.301		
UMACL	No Ride	Baseline	25.0 (5.2)	Day	15.16	.001
		Follow-Up	24.9 (5.6)	Pre/Post	14.41	.001
			Day*Pre/Post	18.48	.001	
	Ride	Baseline	25.5 (5.5)	Day*Gender	.746	.349
		Follow-Up	29.3 (4.4)	Pre/Post*Gender	7.03	.013
				Day*Age	.023	.880
		Pre/Post*Age	.034	.855		

				Day*Pre/Post*Ge	1.04	.317
				nder		
				Day*Pre/Post*Ag	.117	.735
				e		
UMACL	No Ride	Baseline	16.4 (5.6)	Day	8.84	.006
TA		Follow-Up	17.4 (5.8)	Pre/Post	11.97	.002
				Day*Pre/Post	21.82	.001
	Ride	Baseline	16.7 (5.2)	Day*Gender	.143	.708
		Follow-Up	12.3 (4.2)	Pre/Post*Gender	.738	.397
				Day*Age	3.15	.086
				Pre/Post*Age	2.39	.132
				Day*Pre/Post*Ge	.657	.424
				nder		
				Day*Pre/Post*Ag	.431	.516
				e		
UMACL	No Ride	Baseline	19.8 (4.7)	Day	16.19	.001
EA		Follow-Up	20.0 (5.1)	Pre/Post	11.77	.002
				Day*Pre/Post	7.57	.010
	Ride	Baseline	20.5 (4.3)	Day*Gen	.146	.705
		Follow-Up	24.1 (4.8)	Pre/Post*Gen	4.05	.053
				Day*Age	1.30	.262
				Pre/Post*Age	.131	.720
				Day*Pre/Post*Ge	5.29	.028
				nder		

Day*Pre/Post*Ag .665 .421

e

Note: *=interaction, WEMWBS=Warwick Edinburgh Mental Wellbeing Scale, UMACL

HT=UWIST Mood Adjective Checklist Hedonic Tone, UMACL TA= UWIST Mood Adjective

Checklist Tense Arousal, UMACL EA= UWIST Mood Adjective Checklist Energetic Arousal.