



The impact of the Walk With Ease program on lower extremity strength and ambulation in individuals with osteoarthritis

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Abstract

Background/purpose: Osteoarthritis (OA) affects over 30 million adults in the United States and results in a decline in physical activity level contributing to obesity, diabetes and cardiovascular disease. With OA being the leading cause of disability in adults, wellness programs must be established to alleviate its deleterious effects. The purpose of this study is to investigate the impact of the Walk With Ease Program on lower extremity strength and ambulatory function in individuals with osteoarthritis.

Methods: Eight participants engaged in 3 one-hour sessions per week for 6 weeks including education, a warm up, stretching and a structured walking program. Participants were encouraged to increase walking time by five minutes each week of the study. Data were collected pre-intervention, post-intervention, and at 6-month follow-up utilizing the 6-minute walk test and 5-times sit to stand test.

Results: Statistically significant improvements in 6MWT distance and 5xSST time were demonstrated using the Friedman Test ($p < 0.05$). No adverse events were noted by any of the participants. Participants exceeded the minimally clinically important difference for 6MWT distance and minimal detectable change for lower extremity strength by 5xSST times.

Conclusions: A formalized walking program may improve lower extremity strength and ambulatory function in individuals with lower extremity osteoarthritis. Facilitated group walking programs may facilitate population wellness if made available to the public.

Keywords: Arthritis, osteoarthritis, exercise, walking, wellness

Introduction

Osteoarthritis (OA) affects over 30 million adults in the United States [1]. Additionally, an estimated 35 million adults will develop activity limitations as a result of OA by 2040. A high proportion of individuals with arthritis do not participate in physical activity contributing to health risks such as obesity, cardiovascular disease, and diabetes [2]. Arthritis leads to pain, stiffness, swelling, fatigue, disability and decreased quality of life [3]. OA, the leading indication for joint replacement surgery, resulted in over 900,000 knee and hip replacement surgeries in 2009 [4]. Conservative treatment methods, including physical activity, may help individuals with arthritis improve symptoms, decrease surgery needs, and reduce limitations in physical function [5].

Walking and other forms of low impact activity have been successful for individuals with arthritis to help improve functional status without exacerbating pain [5-9]. The multicomponent Fitness and Exercise Program for People with Arthritis (FEPA) demonstrated significant improvements in function and self-reported pain regardless of age [10]. Aerobic exercise can improve aerobic capacity and gait speed [11], and adding resistance exercise may result in improved ADL performance [12]. In a systematic review of aerobic programs, walking programs demonstrated the greatest improvement in pain and functional measures [13]. While aerobic and resistance programs have been found to be equally effective for OA management [9,14], aerobic programs may show additional long-term functional benefits [15].

Kovar et al [8] performed a randomized controlled trial inves-

tigating the combined effects of an 8-week indoor, supervised walking and education program on functional status and pain in individuals with knee OA. The results demonstrated statistically significant improvements for the intervention group in 6-minute walk test (6MWT) distance and Arthritis Impact Measurement Scale, physical activity subscale, compared to the control group that demonstrated a decline in 6MWT distance [8]. Talbot et al [16] studied unsupervised walking programs utilizing a pedometer which demonstrated improved lower extremity strength and functional performance compared to an education only control.

The Arthritis Foundation developed the Walk With Ease (WWE) program to decrease pain and improve functional ability and quality of life in individuals with arthritis. WWE consists of education, group sharing, peer support, socialization, warm up, stretching, walking, cool down, and stretching. These program components, amongst others, have been recommended in prior studies including a systematic review by Westby [13]. Studies have demonstrated the effectiveness of the WWE program at improving pain, fatigue, stiffness, physical function, and perceived quality of life related to OA [5,17,18]. Conte et al [19] studied the WWE program in sedentary older adults with arthritis in various community establishments and results demonstrated statistically significant improvements in pain, fatigue, and physical activity. Nyrop et al [5] examined the effects of WWE on workplace activity limitations in a group of adults with arthritis. Participants demonstrated significant improvements in the Workplace Activity Limitation Scale, which were maintained at one-year follow-up [5].

According to a Lebanon County health needs assessment, 70% of the population is overweight, 35% is obese and >45,000 adults do not meet recommended physical activity guidelines [20]. Obesity has a high correlation with OA due to increased loading and increased inflammatory mediators that deteriorate cartilage [3]. Due to the correlation between obesity, inactivity, and arthritis, it is likely that the local population also has a high prevalence of arthritis. As a result, the WWE program may be an ideal intervention to implement for the local population with arthritis-related symptoms. The purpose of this study was to investigate the impact of the WWE program on lower extremity strength, ambulation, and physical function in individuals with lower extremity osteoarthritis.

Methods

Individuals with lower extremity arthritis were recruited for participation in the study through purposive distribution of flyers to local senior apartments and community and fitness centers. Inclusion criteria consisted of: physician or self-diagnosed lower extremity osteoarthritis, rheumatoid arthritis, or fibromyalgia; age greater than 50 years; experiencing functional impairment due to pain; and ability to walk for 10 minutes. Participants were permitted to use an assistive device during data collection and intervention. Exclusion criteria were medi-

cal instability and lack of physician clearance to participate in physical activity. The study was approved by the Lebanon Valley College Institutional Review Board, participants' rights and responsibilities were explained during recruitment, were protected throughout the course of the study, and informed consent was obtained prior to study implementation.

Prior to the first session, participants signed the Arthritis Foundation WWE waiver and demographic information were collected. Participants completed baseline standardized tests including: 1) numeric rating scales for pain, fatigue and joint stiffness, 2) the 6 Minute Walk Test (6MWT), and 3) the 5 Times Sit to Stand Test (5xSST). Given that numerous studies have demonstrated reductions in pain, stiffness and fatigue as a result of the Walk With Ease program [5,17,18], the primary outcomes for this study were determined in advance to be 6MWT distance and 5xSST time.

Intervention sessions occurred 3 times per week for 6 weeks per the standardized WWE format. Each participant received an educational booklet on arthritis, a journal, and a pedometer. WellSpan Health System provided funding through a Pennsylvania Division of Health Risk Reduction (HRR) Arthritis Program Grant. Grant funds paid for all WWE program materials, Arthritis Foundation participant registrations, and group-facilitator training fees.

Each session, led by graduate physical therapy students, consisted of group sharing, a brief educational lesson related to arthritis self-management, warm up (3-5 minutes), stretching (3-5 minutes), walking (30-45 minutes), cool down (3-5 minutes), and stretching (3-5 minutes) for a total of approximately 60 minute sessions. The intervention occurred on the Lebanon Valley College campus on either an indoor or an outdoor track. Walking occurred outside except when the temperature was below 50° F or in cases of inclement weather.

The goal during walking intervention was for each participant to walk at a moderate-high intensity defined as 60-75% heart rate max or Borg rate of exertion between 12-16 [21]. Participants were educated to utilize the Talk Test in order to monitor intensity, which allows an individual to walk at a moderate intensity, while being able to talk without becoming breathless [22]. The intent was for each participant to achieve at least 30 minutes of walking during each session, or to increase daily walking time by 5 minutes per week of participation. For example, an individual able to walk for a maximum of 15 minutes during week one aimed to achieve 40 minutes of walking time per session upon completion of week 6. Participants were encouraged to walk and incorporate strengthening exercises as outlined in the WWE instruction manual at least 2 additional times per week.

Post-intervention data collected were: 1) numeric rating scales for pain, fatigue, and joint stiffness, 2) 6MWT distance, and 3) 5xSST times. Data again were collected at 6-month follow-up to assess retention of functional improvements as well as ongoing participation in a self-directed walking program, and utilization of WWE program methodology.

Participants using an assistive device during baseline testing utilized the same device for all subsequent data collection.

Data analyses were performed utilizing IBM SPSS Statistics 23. Descriptive statistics were utilized to describe our study population's age and body mass index (BMI). The Friedman Test was utilized for analysis of pain, fatigue, stiffness, 5xSST, and 6MWT results with statistical significance set at $p < 0.05$. Friedman Tests reaching statistical significance had post hoc analyses performed using the Wilcoxon Ranked Signs Test. After application of the Bonferroni Correction to the Wilcoxon Ranked Signs Test, the statistical significance level was $p < 0.02$. Repeated measures data were collected pre-intervention, post-intervention and at 6-month follow-up. All 3 measures were compared using the Friedman Test and, when statistically significant, the Wilcoxon Ranked Signs Test was applied to 1) pre-intervention to post-intervention, 2) pre-intervention to 6-month follow-up, and 3) post-intervention to 6-month follow-up.

Results

Sixteen participants were recruited and 4 declined to participate due to time commitment. Two potential participants met exclusionary criteria: one due to medical instability and one due to inability to walk for 10 consecutive minutes. During the course of the study, 2 participants withdrew due to acute illnesses unrelated to the study. At the conclusion of the intervention, data was analyzed for the 8 remaining participants. One was lost to long-term follow-up, resulting in post to 6-month follow-up data analysis for 7 participants. **Table 1** summarizes participant descriptive statistics. The mean percentage of attendance was 82.64% (range 66.66%-94.44%). No participants had any complaints of pain, discomfort or injury due to participation in this program.

Table 1. Demographics.

| | |
|---------------|--------------|
| Mean Age (SD) | 72.50 (6.23) |
| Sex | 6 F; 2 M |
| Mean BMI (SD) | 29.59 (3.68) |

Note: Female=F and Male=M

Upon completion of the study, outcome measures were analyzed utilizing the Friedman Test. Data analysis demonstrated that participants did not achieve statistically significant improvement in pain ($\chi^2=3.22$ (2), $p=0.20$), fatigue ($\chi^2=3.58$ (2), $p=0.17$), or stiffness ($\chi^2=2.77$ (2), $p=0.25$). There were statistically significant improvements in 5xSST ($\chi^2=11.14$ (2), $p=0.01$), and in 6MWT distance ($\chi^2=12.29$ (2), $p=0.01$). A summary of these findings is in **Table 2**.

Post hoc analysis utilizing the Wilcoxon Ranked Signs Test with Bonferroni Correction applied was performed to further analyze the data for 5xSST and 6MWT. 5xSST demonstrated statistically significant improvement for pre to post-intervention ($Z=-2.52$, $p=0.01$) but not for post-intervention to 6-month follow-up ($Z=-1.01$, $p=0.31$) or for pre intervention

to 6-month follow-up ($Z=-2.37$, $p=0.02$). 6MWT also demonstrated statistically significant improvement in pre to post-intervention ($Z=-2.52$, $p=0.01$) but not for post-intervention to 6-month follow-up ($Z=2.20$, $p=0.03$) or for pre-intervention to 6-month follow-up ($Z=-2.37$, $p=0.02$). A summary of these findings is in **Table 3**.

Table 2. Mean Data from Baseline to Six-month Follow-up –Friedman Test

| Measure | Baseline | 6-weeks | 6-month | p-value |
|-------------|----------|---------|---------|---------|
| Pain | 3.75 | 2.00 | 2.29 | 0.20 |
| Fatigue | 3.13 | 2.63 | 2.14 | 0.17 |
| Stiffness | 5.25 | 2.88 | 2.00 | 0.25 |
| 5xSST (sec) | 18.08 | 11.26 | 12.92 | 0.01* |
| 6MWT (m) | 420.05 | 500.14 | 465.61 | 0.01* |

* denotes p-values of statistical significance ($p < 0.05$).

Table 3. Post-Hoc Analysis – Wilcoxon Rank Signs.

| Baseline to Post-Intervention | | | | |
|--|----------|---------|---------------|---------|
| Measure | Baseline | 6-weeks | Mean Δ | p-value |
| 5xSST (sec) | 18.08 | 11.26 | -6.83 | 0.01* |
| 6MWT (m) | 420.05 | 500.14 | 80.09 | 0.01* |
| Post-Intervention to Six-month Follow-up | | | | |
| | 6-weeks | 6-month | Mean Δ | p-value |
| 5xSST (sec) | 11.26 | 12.92 | 1.66 | 0.31 |
| 6MWT (m) | 500.14 | 465.61 | -35.53 | 0.03 |
| Baseline to Six-month Follow-up | | | | |
| | Baseline | 6-month | Mean Δ | p-value |
| 5xSST (sec) | 18.08 | 12.92 | -5.16 | 0.02 |
| 6MWT (m) | 420.05 | 465.61 | 45.56 | 0.02 |

* denotes p-values of statistical significance ($p < 0.017$) after Bonferroni Correction.
 Δ = change

Further analysis of pre to post-intervention data revealed all participants met the minimal detectable change (MDC) of the 5xSST time [23] for the geriatric population. Four out of 8 participants improved 5xSST from at risk to not at risk for falls [24]. Six out of 8 participants met the minimally clinically important difference (MCID) for OA of the 6MWT [25]. See **Figure 1** for a summary of results.

Data analysis comparing pre-intervention to 6-month follow-up was conducted to assess if clinically meaningful changes were maintained. Four of 7 participants maintained MDC for the 5xSST. Of the 4 participants who improved 5xSST time from at risk to not at risk for falls after intervention, 2 remained beneath the falls risk cutoff at 6-month follow-up. Two of 7 participants maintained MCID for 6MWT. See **Figure 2** for a summary of results.

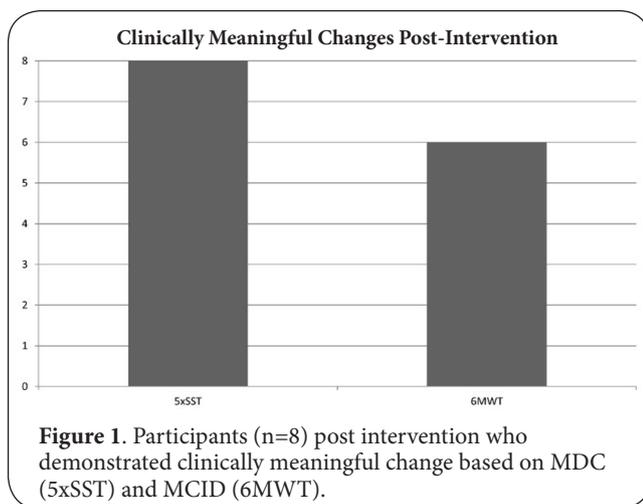


Figure 1. Participants (n=8) post intervention who demonstrated clinically meaningful change based on MDC (5xSST) and MCID (6MWT).

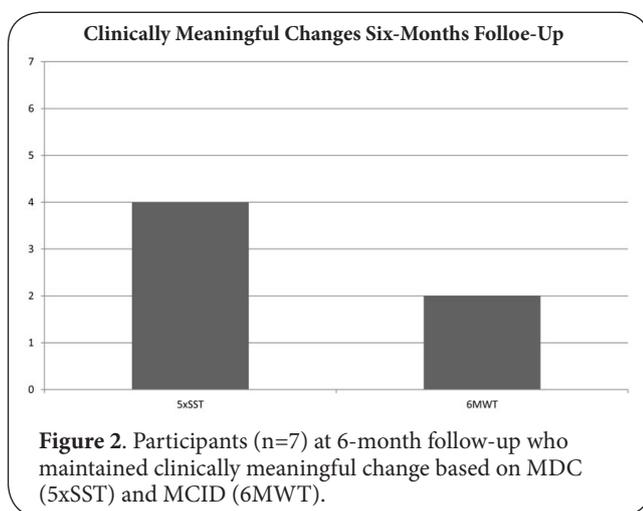


Figure 2. Participants (n=7) at 6-month follow-up who maintained clinically meaningful change based on MDC (5xSST) and MCID (6MWT).

Discussion

The main objectives of this study were to investigate the benefits of the WWE program on lower extremity strength, ambulation, and physical function in participants with lower extremity arthritis. Participants demonstrated statistically and clinically significant improvements for primary outcomes of the study. Improvements in 6MWT distance may be attributed to improved muscular and cardiovascular endurance, which is consistent with previous research [8,11,12]. Decreases in 5xSST time could be attributed to improved muscle strength, power and recruitment.

An unexpected finding was that the numeric rating scales for pain, stiffness, and fatigue did not demonstrate statistically significant change as per prior studies [18,19]. Another unexpected finding was that 4 out of 8 participants started the program considered at risk for falls as indicated by the 5xSST, and ended the intervention beneath the fall risk cutoff time [24].

Adherence during this program was higher than in previous studies utilizing WWE [19]. This may be attributed to our

participants having an interest in fitness and exercise, and therefore being more motivated to attend sessions. Our small sample size and sampling bias may also be contributory. Long term adherence with a walking program is critical [12] and previous research has shown that aerobic programs are effective [5-9]. Walking programs tend to have a low adherence rate [13], when compared to other aerobic exercise, but our small group setting may have been more enjoyable and led to increased adherence.

Six-month follow-up assessment demonstrated that participants were able to maintain functional gains in 5xSST. At 6-month follow-up, 6 out of 7 participants reported continued walking for exercise but not adhering to WWE guidelines. It is possible that lack of a formal program structure and loss of group dynamic led to a decrease in frequency and intensity of walking, which may explain why further gains did not occur during the post-intervention to 6-month follow-up interval. When treating OA conservatively, it is important to encourage continuation of a long-term [12], structured walking program in order to have optimal success and prevent functional declines over time.

Costs associated with the upstart and administration of the WWE program may hinder its utility on a large scale. Each group facilitators' training costs \$89.00 and each participant must pay \$11.95 to participate. In under-resourced populations, this may present a barrier to disseminating its educational and physical benefits. Despite this barrier, there is potential for physical therapists to implement a personalized walking program utilizing WWE components for their patients with OA.

There were several limitations to the generalizability of this study. The first was a small sample size and lack of ethnic and gender diversity. Secondly, we did not recruit participants with physician diagnosed and radiograph confirmed osteoarthritis. Thirdly, we lacked a control group and we did not control for activities performed outside of the program.

Future research would benefit from investigating the feasibility of physical therapists to implement the philosophy of this walking program in conjunction with physical therapy sessions as part of an integrated home exercise program. WWE could also serve as a community wellness program that may be administered through college associated Pro Bono clinics. Physical therapy management of OA may be more effective with the addition of a walking program, which could decrease the utilization of joint replacement surgeries, ultimately saving valuable healthcare resources.

Conclusion

Walking is a safe and effective intervention, and the WWE program can improve functional outcomes in individuals with lower extremity osteoarthritis. WWE resulted in lasting outcomes: statistically significant improvements in lower extremity strength and walking distance as demonstrated by 5xSST and 6MWT respectively. This is extremely important as arthritis is one of the most prevalent causes for limitations in

physical function. Previous research [7-9,11,12,14,18,19] and the current study have shown that low impact physical activity, including walking, is beneficial and low risk for people with arthritis. Physical therapists can incorporate a structured walking program such as WWE as an adjunct to a patient's home exercise program or as part of a community wellness program in order to improve functional outcomes in patients with lower extremity osteoarthritis.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

| Authors' contributions | JTM | CDG | DCR | TAG |
|------------------------------------|-----|-----|-----|-----|
| Research concept and design | ✓ | ✓ | ✓ | ✓ |
| Collection and/or assembly of data | ✓ | ✓ | ✓ | ✓ |
| Data analysis and interpretation | ✓ | ✓ | ✓ | ✓ |
| Writing the article | ✓ | ✓ | ✓ | ✓ |
| Critical revision of the article | ✓ | -- | -- | -- |
| Final approval of article | ✓ | ✓ | ✓ | ✓ |
| Statistical analysis | ✓ | -- | -- | -- |

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