

Health-related quality of life and balance confidence among participants in a senior community-based exercise (SWIFT) program compared to age matched controls: a cross-sectional study

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Background: *Staying Well, Independent and Fit Together (SWIFT), a seniors' exercise program, aims to promote health, strength, mobility and community engagement. We compared quality of life and balance confidence in SWIFT participants and non-participants, aged 60 years and older.*

Methods: *Cross-sectional study comparing participants and non-participants in SWIFT program*

Contexte : *Staying Well, Independent and Fit Together (SWIFT) est un programme d'exercice physique pour personnes âgées visant à promouvoir la santé, la force, la mobilité et la participation aux activités de la collectivité. Nous avons comparé la qualité de vie et le degré de confiance de la personne dans son équilibre entre des sujets participant au programme SWIFT et des sujets n'y participant pas, tous ayant 60 ans et plus.*

Méthodologie : *Étude transversale visant à comparer l'état de participants au programme SWIFT à celui de*

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using Older People's Quality of Life Questionnaire (OPQOL) and Activities-specific Balance Confidence Scale (ABCS).

Results: Seventy participants completed surveys, 41 in experimental and 29 in control group. We found a statistically significant between group difference favoring the control group in overall OPQOL score but not in OPQOL subscale nor overall ABCS scores. Participants in both groups participating in weekly exercises had non-significantly higher quality of life subscale scores.

Conclusion: Results suggest seniors in both study groups who participate in exercise have non-significantly higher quality of life scores compared to those who do not participate in exercise. Participation in the SWIFT exercise program or activity in general, contributes to quality of life in seniors.

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KEY WORDS: seniors, exercise program, quality of life, balance, chiropractic

Introduction

Group exercise classes improve not only physical outcomes in seniors but emotional and quality of life outcomes.^{1,2} Improving such outcomes leads to additional benefits such as better balance, increases in weekly social activities and the ability of seniors to achieve their activities of daily living without assistance.^{1,2} These benefits increase the likelihood that seniors can live independently in their own home for longer periods. Seniors' group fitness programs can provide such benefits.

In a study assessing a seniors' fitness program focusing on flexibility, strength, balance and endurance, the authors reported a significant increase in function, physical and emotional health in the exercise group participants' program compared to non-participant matched controls.³ In another study, senior subjects participating in a Pilates

non-participants à l'aide de l'Older People's Quality of Life Questionnaire (OPQOL) et de l'échelle de mesure du degré de confiance de la personne dans son équilibre associé aux gestes de la vie quotidienne (échelle ABC-S).

Résultats : Soixante-dix participants ont rempli les questionnaires, 41 dans le groupe expérimental et 29 dans le groupe témoin. On a observé une différence importante sur le plan statistique entre les groupes en faveur du groupe de contrôle pour ce qui est du score global au OPQOL, mais non pour le score de la sous-échelle du OPQOL ni pour le score global de l'échelle ABC-S. Chez les sujets des deux groupes faisant les exercices hebdomadaires, on n'a pas observé de scores supérieurs significatifs de la sous-échelle de la qualité de vie.

Conclusion : Les résultats semblent montrer que chez les sujets âgés des deux groupes suivant le programme d'exercices, les scores de qualité de vie ne sont pas plus élevés, d'une manière significative, que ceux des sujets ne suivant pas le programme. Le programme SWIFT, et de façon générale l'activité physique, contribue à la qualité de vie des personnes âgées.

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MOTS CLÉS : personnes âgées, programme d'exercice physique, qualité de vie, équilibre, chiropratique

exercise program, comprised of 30-minute sessions twice a week for six months, reported an increase in quality of life as measured by the SF-36 compared to a control group.⁴ Similarly, exercise programs have also yielded significant improvements in physical, mental and social well-being.⁵⁻⁸ Such improvements were assessed after a short time period (two to eight weeks) of structured group exercise programs. Another study showed that individuals who had higher leisure time physical activity throughout adulthood had lower risks for all-cause, cardiovascular- and cancer-related mortality.⁹ These findings suggest there are positive benefits for seniors who participate in structured group exercise programs.

Staying Well, Independent and Fit Together (SWIFT) is such a structured seniors' exercise program. The program aims to promote, improve and maintain physical strength,

balance confidence and mobility, promote health and safety, and encourage community engagement through social interaction in the group. Preliminary empirical evidence suggests that the SWIFT program has a positive effect on seniors' quality of life.¹⁰ Despite a small sample size, participants reported improvements in strength, movement, balance and endurance. Unfortunately, more robust data collection processes to capture basic administrative and measurable outcomes were not available. Collection of program data is important to assess the usefulness of this educational experience for interns and ensure adequate resources are available to sustain growth and determine the comparative effectiveness and benefit to seniors.

Our main objective was to assess if seniors participating in a community-based exercise program have higher quality of life, balance confidence, and social engagement scores compared to a non-participant group of seniors. We hypothesized that participants in the SWIFT program would experience more positive physical, mental and social well-being outcomes compared to non-participants. Our secondary objective was to develop a data collection tool to capture key indicators of program outcomes.

Methods

To assess the impact of the SWIFT program, we compared the main outcomes collected from the program participants (exercise group) to an age-matched senior cohort from same three-church (TCC) community who were not participating in the SWIFT program (control group). Ethics approval was obtained through the Research Ethics Board of the Canadian Memorial Chiropractic College (CMCC) (REB # 1807B01).

Study design

We conducted a cross-sectional study between September and December 2018 from a convenience sample of TCC community members over the age of 60 years.

Participants

All participants in the SWIFT program (exercise group) who were 60 years and older were eligible to participate. We recruited participants via announcements made at the beginning of exercise classes, as well as via TCC announcements. Participants in the SWIFT program attend free of charge and sessions are offered three times a week. Each session consists of approximately 15 minutes

of cardiovascular exercise warm-up, 30 minutes of upper and lower body muscle strengthening using resistance bands, and a 15-minute cool down including stretching and balance exercises.

We recruited non-participants (control group), aged 60 and older via announcements made during formal TCC events, electronic and print bulletins, and posters placed at TCC. Leadership of the TCC endorsed the study and committed to assist in making announcements during their services. Participants were not compensated for completing the surveys, although we offered them an opportunity to win one of four \$25 Shoppers Drug Mart gift cards via random draws of participants from both groups who agreed to provide their contact information.

Outcome measures

Our primary outcomes were the Older People's Quality of Life Questionnaire (OPQOL) and Activities-specific Balance Confidence Scale (ABCS). The OPQOL was developed from a constructivist approach that integrates theory with lay views of the meaning of quality of the lived lives of a representative sample of older people.^{11,12} The OPQOL is a 35-item questionnaire, with items scored on a five-point scale ranging between strongly agree and strongly disagree. Higher scores relate to higher quality of life. It assesses the following dimensions of quality of life (QOL): life overall (four items), health (four items); social relationships (five items); independence, control over life and freedom (four items); home and neighbourhood (four items); psychological and emotional well-being (four items); financial circumstances (four items); leisure and activities (four items); and religion (two items).⁸ The OPQOL has sound psychometric properties (e.g. internal consistency: α 0.78-0.90; test-retest intra-class correlations at four weeks ranged 0.40 to 0.78, with lower correlations related in changes in life; construct validity significantly correlated with self-rated active ageing), and it also performs well among ethnically diverse senior populations.¹¹⁻¹³

The ABCS is a 16-item, self-report measure that assesses the participant's confidence in performing different ambulatory skills without falling. It is based on Bandura's theory of self-efficacy and assesses the subject's confidence in maintaining balance while performing various tasks.¹⁴ The assessment typically takes five to ten minutes to administer.¹⁵ Respondents rate their confidence in these

activities on a scale from 0% to 100%, where a score less than 67% suggests an increased risk of falling. The ABCS has adequate to excellent concurrent (balance confidence inversely related to worry about falling) and construct (scores related to demographic, functional measures and clinical variables) validity, excellent test-retest reliability (intra-class correlation 0.79) and internal consistency (Cronbach's $\alpha = 0.95$) in older adults.^{14,15}

In addition, we collected participant demographic data. These data included: age, gender, living situation, if they volunteered in their community, and if they participated in any physical activity outside of the SWIFT program. These variables were included because previous studies suggested they were associated with physical inactivity and poorer outcomes.^{9,17-19} Finally, we assessed the functionality of the data collection tool by evaluating its ease of use and user preference. Qualitative feedback was obtained from a convenience sample of participants.

Procedure

We obtained informed consent from both the experimental and control groups. After obtaining informed consent, both groups completed the same questionnaire that was made available in two formats: 1) paper based and 2) electronically via an email link to SurveyMonkey (SurveyMonkey Inc.; San Mateo, California, USA; www.surveymonkey.com). These different formats optimized data collection as some seniors were more comfortable with one format than the other and some had limited access to the internet. All participants used ID codes provided by the SWIFT program coordinator. Paper surveys included a signed consent form that was removed and secured by the Parish Nurse before completed surveys were submitted for analysis. Participants who used the online format provided consent by submitting the survey. We collected data over a four-week interval following the first in-class announcement.

Paper surveys were distributed to participants in the exercise group at the end of classes, and to those in the control group following a regular Sunday worship service. They completed the surveys at home and returned them before the end date of the study. Participants in both groups who chose to do the surveys online were given email access at the same time.

We de-identified the paper-based surveys and entered responses in an Excel spreadsheet. The data were collated

on a password-protected computer and stored in a secure office at the CMCC. Data downloaded from the electronic online survey were securely stored on a CMCC server using VPN access with appropriate password protection and encryption.

Finally, at the conclusion of the study we invited all participants, including all members of the TCC community, to a free information seminar during which refreshments were served. The community was informed via posters distributed about the TCC building, announcements placed on TCC website, and the provision of take-away handout seminar notices which all acknowledged support from the Ministry of Seniors Affairs. A CMCC intern and TCC staff presented at each of the events. The seminar provided an overview of the SWIFT program and study results, whilst also promoting the Ontario Ministry of Seniors Affairs' Staying Healthy and Active Campaign.

Statistical analysis

To assess the potential impact of the SWIFT program, we compared the main outcomes collected from participants in the experimental group with those not involved in the SWIFT program (control group). The data were descriptively analyzed (frequencies, means, medians, standard deviations (SD), 95% confidence intervals (95%CI)). Tests of difference were used to assess outcomes between groups, including Pearson chi-square (categorical variables of gender, dwelling type, living situation and volunteer status); t-tests for independent samples for age, and outcome scores (ABCS and OPQOL). In addition, the outcome scores were compared between seniors reporting participation in weekly activity and those not, regardless of study group using t-tests. Missing data were recorded as missing and not imputed. The level of significance was set at the 0.05 level. Free text comments were reviewed and collapsed into common categories and descriptively analyzed. The statistical analysis for this study was generated using SAS© v9.4 (SAS Institute Inc., Cary, NC, USA).

Results

Subject Characteristics

Seventy subjects completed the surveys, 29 were participants in the control group and 41 in the experimental group. There were 52 females and 18 males with no dif-

Table 1.
*Demographics of the Experimental and Control groups
 (gender, age, living situation, volunteering/social interactions throughout the month).*

| Characteristic | Experimental group N=41 | Control group N=29 | Statistical significance of variables between experimental and control groups |
|-------------------------------------|----------------------------|-----------------------|--|
| Gender | | | 0.45 (p-value from χ^2) |
| Female n (%) | 33 (81) | 19 (66) | |
| Age mean (SD) | 71.7 (6.68) | 76.1 (8.61) | 0.019 (p-value from t-test) |
| Mean (range) time in SWIFT (months) | 38.4 (1-78) | NA | |
| Living situation | | | 0.86 (p-value from χ^2) |
| Living alone n (%) | 14 (34) | 9 (31) | |
| Living with someone n (%) | 20 (49) | 16 (55) | |
| Did not specify n (%) | 7 (17) | 4 (14) | |
| Dwelling Type | | | 0.34 (p-value from χ^2) |
| Apartment/Condo n (%) | 21 (51) | 10 (35) | |
| House/Townhouse n (%) | 17 (42) | 15 (52) | |
| Did not specify n (%) | 3 (7) | 4 (14) | |
| Volunteer Yes n (%) | 21 (51) | 22 (76) | 0.04 (p-value from χ^2) |

ference in sex distribution between groups. The overall mean age was 73.68 (SD 7.87), ranging between 59 to 91 years. The mean age between groups was significantly different, being about 4.4 years older in the control group on average compared to the experimental group. Subjects in the experimental group reported average participation in the SWIFT program of 38.4 months, ranging from one to 78 months. Volunteering and social activities that the participants partake in were also recorded. Some of the volunteering activities the participants partake in include: 25 individuals volunteering at a church, six assisting other seniors in the community, two assisting at libraries and nine that assist at other associations throughout the community. Subject details for all participants are presented in Table 1.

We found no significant difference in the overall ABCS scores between the experimental and the control groups. We found a significant difference between the two groups for their overall OPQOL scores; the control group had a higher OPQOL average score (Table 2). Mean OPQOL subscale scores were not significantly higher in the control group compared to the experimental group (Table 2).

There was no statistically significant difference in the average ABCS score for female participants (86.79, SD 13.19) compared to the male participants (88.39, SD 9.26). There was also no significant difference between the average OPQOL score for female participants (4.02, SD 0.44) compared to the male participants (4.07, SD 0.37). There were also no differences in the mean ABCS

Table 2.
Overall scores of ABCS and OPQOL, and subscales of OPQOL for participants (Experimental group) and non-participants (Control group) of the SWIFT program.

| Scale | Experimental group mean (SD) N=41 | Control group Mean (SD) N=29 | p-value from t-test |
|-----------------------|-----------------------------------|------------------------------|---------------------|
| Overall ABC Scores | 87.96 (12.82) | 86.74 (11.20) | 0.68 |
| Overall OPQOL Scores | 3.91 (0.39) | 4.20 (0.42) | 0.0075 |
| OPQOL Subscale Scores | | | |
| Life Overall | 4.18 (0.50) | 4.43 (0.49) | 0.93 |
| Health | 3.73 (0.58) | 4.00 (0.54) | 0.69 |
| Social | 3.40 (0.47) | 3.86 (0.55) | 0.32 |
| Independence | 4.02 (0.48) | 4.22 (0.56) | 0.34 |
| Home | 4.23 (0.47) | 4.43 (0.48) | 0.88 |
| Psychological | 4.15 (0.43) | 4.35 (0.51) | 0.32 |
| Finance | 3.97 (0.66) | 4.12 (0.73) | 0.60 |
| Leisure | 3.83 (0.51) | 4.04 (0.55) | 0.68 |
| Religion | 4.32 (0.54) | 4.35 (0.70) | 0.22 |

scale or mean OPQOL scores related to participants' living situations.

We found that in the total sample, 20 individuals did not participate in any other exercise and 50 did participate in other exercises, including the SWIFT program. Eighteen of those who participated in regular additional exercise walked, eleven worked out at home or at a gym, four did yoga, seven participated in Tai Chi, six danced for exercise and four golfed. Mean ABCS scores, overall OPQOL score and all OPQOL subscale scores were consistently higher among those reporting participation in exercise than in those not, with only the difference for OPQOL Life Overall and Home subscales achieving significance (Table 3).

Social-educational events:

Upon completion of data collection and analysis, we held

two social-educational events for invited participants. Twenty-nine participants attended the first presentation, including 21 SWIFT participants and eight from the community. Twenty-two participants attended the second presentation, with 15 SWIFT participants and seven from the community. After these sessions, seven individuals were interested in joining the SWIFT program. We also received several testimonials from the SWIFT program participants after these sessions which included one female participant who explained that she had undergone knee surgery earlier in the previous year and how much the exercise program helped to get on her feet faster than she would have ever expected. Another female participant remarked how much she would sweat during the exercises and how she knew how it was helping her keep active.

Table 3.
Scores of the OPQOL subscales comparing participants who participated in weekly exercise.

| Scale | Participation in Weekly exercise (no) mean (SD) N=20 | Participation in Weekly exercise (yes) mean (SD) N=50 | p-value from t-test |
|-----------------------|--|---|---------------------|
| Overall ABC Scores | 83.56 (14.63) | 88.57 (10.88) | 0.12 |
| Overall OPQOL Scores | 3.91 (0.47) | 4.10 (0.40) | 0.11 |
| OPQOL Subscale Scores | | | |
| Life Overall | 4.09 (0.55) | 4.40 (0.47) | 0.02 |
| Health | 3.70 (0.55) | 3.91 (0.57) | 0.16 |
| Social | 3.50 (0.40) | 3.65 (0.60) | 0.31 |
| Independence | 4.04 (0.53) | 4.16 (0.48) | 0.36 |
| Home | 4.15 (0.57) | 4.41 (0.42) | 0.04 |
| Psychological | 4.11 (0.57) | 4.30 (0.20) | 0.14 |
| Finance | 4.00 (0.60) | 4.05 (0.73) | 0.70 |
| Leisure | 3.78 (0.55) | 3.98 (0.52) | 0.15 |
| Religion | 4.32 (0.64) | 4.39 (0.54) | 0.73 |

Software programming for future data collection

We programmed the online survey, including the demographic, balance confidence and quality of life outcomes in an offline-capable format. All features of the survey (including demographic information) remained constant between the online/offline formats. After assessing the landscape for offline-capable survey platforms, we decided that the most feasible option was to utilize Microsoft Excel software's ability to save locally to work around the networking issues.

We uploaded the program onto two Lenovo TAB3 10 Business tablets, with 32GB of internal memory. The use of the tablet allows for offline and online capabilities, within a functional yet resistant body. In addition, the "Business Features" of the standard Android 6.0 installed platform includes hardware encryption and remote ac-

cess, so that if the onsite internet becomes accessible, the online version of the survey is accessible.

Discussion

We found a significant difference in the overall quality of life score favouring the control group but not in balance confidence between the experimental and control groups. When looking into the living situation for individuals, we found no significant difference in quality of life scores or balance confidence for those who lived with another person in their household and those that did not. We also found no significant differences in overall ABCS and OPQOL scores by age and gender. Although the overall OPQOL and ABC scores between the two groups differed, we did find that exercise in any capacity was related to the outcomes scores.

We asked all participants (in both experimental and

control groups) whether they participated in any regular exercise (apart from the SWIFT program) throughout the week. We found consistently higher mean scores for the ABCS and all components of the OPQOL including overall happiness, ability to enjoy their life more, and feeling safer within their homes and communities among those reporting exercise participation, albeit only significant differences for the life and home sub-sections of the OPQOL.

Lastly, we noted how many participants chose to complete the questionnaires online or in paper format for future reference. Thirty-seven out of the 70 participants chose to complete the online version, and most reported how simple it was to use the SurveyMonkey link that was provided through email. The majority of survey respondents in both groups (online and paper formats) responded positively to questions about the ease of data collection when verbally questioned by the Parish Nurse. Those who reported being experienced computer users preferred the online version. In contrast, those with limited or no computer skills preferred the paper version.

Our finding of no significant difference in scores between the experimental and control groups for the ABCS and OPQOL subscale scores, but a significant difference in overall OPQOL score favouring the control group, is not consistent with previous studies assessing seniors in similar exercise groups.^{1-3,9,14,17,18} One such study reported that seniors' fitness programs significantly improve function, physical and emotional health when compared to non-participant matched controls.³ Others have shown that group exercise programs have a beneficial effect on risk factors for falls, such as balance, gait and strength.¹⁴ In a meta-analysis of twenty-one studies assessing exercise interventions for preventing falls among frail older people living in care facilities, including 5540 participants, exercise interventions were found to effectively reduce the rate of falls in older people. Further, the evidence supports the use of balance training for fall prevention and highlights the importance of combining exercise and fall interventions in reducing rates of falling.¹ In a systematic review that included 18 studies administering exercise programs to participants over the age of 65, exercise therapy was effective in decreasing depressive symptoms, and led to improvements in both the quality of life and self-esteem scores.² In a study looking at older adults living alone and living with someone, the participants that were living

alone or not being able to remain alone at home had lower quality of life scores.¹⁷ Another study showed that older women were more likely to experience joint pain if they lived rurally, were more overweight, have poorer physical and emotional health related to quality of life and use more medications.¹⁸ It has also been shown that increased physical activity engaged throughout adulthood was correlated with a decrease in all-cause, cardiovascular and cancer related deaths.⁹ Thus, exercise and physical activity appear to be associated with improved quality of life, well-being and reduced rates of falling.

The lack of significant differences in the exercise group reported in our study, compared to the aforementioned studies, is likely due to the healthy and active attributes of our control group participants, who were already participating in other exercise or physical activities. Our control group had a high participation rate in exercise that did not include the SWIFT exercise program, therefore they were keeping active in other ways. Both groups came from the same church community that shares a strong faith and similar socioeconomic status, which led to both groups being very similar in demographic information. Furthermore, since we were unable to include a baseline measurement for the experimental group, we were unable to assess if there was change in the SWIFT program participants' balance confidence and quality of life over time. Future study with a more robust design could assess if the SWIFT program results in improved quality of life and balance confidence in seniors.

We conducted two educational sessions with both SWIFT participants and community members. The sessions allowed for the dissemination of the knowledge acquired from our results to the community. Despite encouragement by funding agencies and institutional review and ethics boards to disseminate research results to participants and communities, this is rarely done.²⁰ More importantly, the majority of participants in health research are interested in receiving results from studies they were involved and validates their participation.^{20,21} This is particularly pertinent when study findings are related to personal or family members' health.²⁰ It appears that those attending our sessions were interested in the results, as seven additional community members were motivated and encouraged to enroll in the SWIFT program.

Finally, we accomplished our second objective by replicating all features of the survey (including demographic

information) into both online/offline formats accessible on a functional tablet. In so doing, baseline data from all new participants in the SWIFT program can be tracked and their outcomes monitored and compared over time. This will allow for program assessment and potential modifications as required.

Strengths and limitations

Our study had some strengths, for instance we used psychometrically sound outcome measures. We had similar communities within the Tri-Congregational Churches when comparing the experimental and control groups. This made it easier for the study to be completed since the groups were similar in age, gender and living situations.

The study also had several limitations. First, despite various efforts to recruit participants, our samples sizes were small and varied between the groups, which may explain differences in demographic variables, as well as higher but not significant between-group scores suggesting a possible Type II error. Second, we did not know the experimental group's baseline measurements prior to their starting the SWIFT exercise program, so could not assess change over time. Third, the range of time participants were engaged in the SWIFT program was large and the impact of SWIFT may have been lessened on participants with limited time in the program. However, only four participants were new to the program and were unlikely to have substantially affected mean scores. Fourth, the surveys were completed in the privacy of the participant's own home, so there is a possibility of a response bias. A non-response bias, especially in the control group is possible. Since the control group was recruited through announcements, those that felt like they had a poorer quality of life or physical abilities may have chosen not to participate in the study. There was no measure used to test participants' physical capabilities. Finally, since the participants came from a similar community they might have provided answers that were more socially acceptable, such as being happier with their overall life or being healthier than they actually are. Having such a similar group from the Tri-Congregational Churches also could have resulted in a selection bias. This community is likely not completely representative of the older population because there are many opportunities for the participants to be more socially engaged than those that may be more socially isolated.

Conclusion

We found no significant differences in the ABCS and the OPQOL subscales, and a significant difference in the overall OPQOL scores, between those who participated in the SWIFT program and those that did not. However, when comparing the overall results of the two groups, we found that exercising in any capacity was associated with significantly higher reported quality of life scores in regards to enjoying their lives more, and feeling safer in their homes and communities. This suggests that being part of the SWIFT exercise program or remaining active one way or another contributes to enhanced quality of life in seniors. Finally, conducting educational sessions to inform seniors of the benefits of exercise programs appears helpful in encouraging those who may not have otherwise considered participating. Future research should assess if the SWIFT program balance confidence, balance and quality of life outcomes in seniors improves compared to baseline measures and over time.

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