



Health benefits of “Thursdays at the Montreal Museum of Fine Arts”: Results of a randomized clinical trial

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ABSTRACT

Objective: . This study aims to examine and compare changes in frailty status, well-being and quality of life in community-dwelling older adults living in Montreal (Quebec, Canada) participating in a 3-month session of weekly “Thursdays at the Museum” and in their control counterparts who did not participate in art-based activities.

Methods: . 165 older community dwellers were recruited to a randomized controlled trial with two parallel groups (intervention *versus* control). The intervention was weekly participatory art-based activities over a 3-month period carried out at the Montreal Museum of Fine Arts (MMFA, Montreal, Quebec, Canada). Frailty, well-being and quality of life were assessed using standardized questionnaires completed at baseline (M0) and before the fifth (M1), ninth (M2) and twelfth (M3) workshops in the intervention group. The control group completed these questionnaires according to the same schedule. The outcomes were mean values of frailty, well-being and quality of life scores, as well as the distribution of frailty categories (vigorous *versus* mild, moderate and severe frailty) at M0, M1, M2 and M3.

Results: . The intervention group showed significant improvements in frailty, well-being and quality of life scores ($P \leq 0.004$) when compared with the control group.

Conclusion: . The results suggest that the 3-month session of weekly “Thursdays at the Museum” may improve both physical and mental health in Montreal community-dwelling older adults.

1. Background

The World Health Organization (WHO) European Regional Office reported that art-based activities (*i.e.*, activities involving creative imagination that express technical proficiency, beauty, emotional power, or conceptual ideas), regardless of their characteristics, may benefit both mental and physical health in a scoping review published at the end of 2019 (1). For older individuals, it was underscored that engagement in art-based activities may reduce the risk of developing frailty and slow down frailty’s progression (1). An art-based activity is a multimodal intervention involving sensory, cognitive and emotional

stimulation that usually evokes a positive experience and can improve individuals’ well-being, quality of life and physical health condition which includes frailty (1). Frailty is an age-related syndrome characterized by being vulnerable to adverse health outcomes and results from physiological aging-associated decline combined with cumulative chronic comorbidities and social issues such as isolation (2,3). In Canada, it was estimated that 1.5 million older individuals were frail in 2019 (4). In 10 years, well over two million Canadians may be living with frailty (4). Due to their health benefits, art-based activities could be a solution to address the challenge of preventing frailty in Canada’s aging population.

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Museums and art galleries are key stakeholders in the artistic milieu. Traditionally, their vocations were to be collectors and guardians of cultural artifacts and institutions of arts education, but this has changed with time (5). Today, they are academic and research institutions. More recently, museums and galleries have begun hosting art-based activities that bring community dwellers into their spaces and have, thus, been identified as potential key actors in support of a healthier population (6–12). According to the WHO review and the English Alliance of Museums for Health and Wellbeing (EAMHW), art-based activities may be efficient and cost-effective interventions to improve both mental and physical health, but more supporting evidence is needed (1,13). In 2018, an EAMHW report titled "Museums for Health and Wellbeing" identified focusing on aging populations and validating the positive effects of museums' art-based activities with appropriate tools and study designs as priorities for the coming years (13).

Few museum art-based activity programs have involved older adults living in the community (1,11,14). Frailty may be prevented or reversed at its onset, explaining why older adults with mild frailty may benefit from interventions aimed at reducing it the most when compared to those with more advanced stage of frailty (3,15). Recently, we showed that it was possible to reverse frailty in older community dwellers living in Montreal (Quebec), especially those early in the onset of frailty (15). A pre-post intervention, single arm, prospective and longitudinal design showed the multidimensional benefits of a 3-month session of weekly "Thursdays at the Museum." This art-based activity, developed by the Montreal Museum of Fine Arts (MMFA, Montreal, Quebec, Canada), reduced frailty and improved participants' well-being and quality of life (15). The main limitation of this first experimental study was its design, as it was not a randomized clinical trial (RCT), which is the methodological gold standard for examining the effects of such interventions (16). Thus, a second experimental study was performed to evaluate the hypothesis that it is possible to reproduce the health benefits observed in the first study using a RCT design. This second study aims to examine and compare the changes in frailty, well-being and quality of life observed in older adults participating in a 3-month session of weekly "Thursdays at the Museum" at the MMFA and in their control counterparts who did not participate in art-based activities.

2. Materials and Methods

2.1. Population

A total of 165 participants living in the urban area of Montreal (Quebec, Canada) were recruited and completed a 3-month period of assessment between March 2019 and November 2019. A full description of the recruitment and follow-up procedure has previously been described (15). Briefly, individuals enrolled in the study were: MMFA visitors; aged 65 and over; living at home or in an autonomous residence with internet access; able to understand, read and write French and/or English; agreeing to give informed consent and life expectancy over 15 months. Among those contacted by email, 209 registered on the McGill Centre of Excellence on Longevity (CEEXLO; Montreal, Quebec, Canada) Web platform. They were contacted for a phone screening of the selection criteria and 11 (5.3%) were excluded. A total of 198 individuals were enrolled in the study, signed the consent form and randomized to intervention and control groups. Among them, 13 (6.6%; 3 in the intervention and 10 in the control group) withdrew their consent before the baseline assessment. 185 (93.4%) participants (97 in the intervention group and 88 in the control group) underwent the full baseline assessment. 15 (15.5%) participants in the intervention group and 5 (5.7%) in the control group dropped out during the 3-month follow-up period. Among participants having dropped out, 1 in the control group and 3 in the intervention group withdrew their consent after the first workshop (M0). A total of 4 participants in the control group and 12 in the intervention group missed at least two assessments (M1, M2, M3) over the follow-up period. There was no significant difference in

baseline characteristics between those who dropped out and those who did not drop out (Data not shown). Figure 1 shows a flow diagram detailing participant selection and follow-up in the RCT.

2.2. Study design

The study was a unicenter (the MMFA in Montreal, Quebec, Canada) controlled RCT in two parallel groups: an intervention group composed of individuals who participated in "Thursdays at the Museum" versus a control group composed of individuals who did not participate in this art-based activity. Control group participants were asked to commit to withholding participation in art-related interventions for the study period, to avoid participating in social programs and to report any other activity practiced during the same time. Participants were randomly allocated to intervention (participatory art-based activity) or control (i.e., no participation in an art-based activity) groups by a block randomization with a block size of 1. The block randomization method is designed to randomize participants into groups of equal sizes. This method is used to ensure a balance in sample size across groups over time. Participants were not blinded to the intervention, whereas investigators were blinded to the allocation of the intervention and assessment of results. This RCT is registered on the [ClinicalTrials.gov](https://clinicaltrials.gov) website (project number NCT03679715) and followed the CONSORT guidelines for RCTs (17).

2.3. Intervention

The intervention was a participatory art-based activity consisting of art creation in a group setting during weekly 2-hour afternoon workshops performed in a dedicated room at the MMFA. A session was composed of 12 consecutive weeks. Two sessions (March to May 2019 and September to November 2019) were set up. Each session's participants were also separated into two groups, which met either Tuesdays or Wednesdays. Different topics were explored over four consecutive workshops for each of the three months. The monthly topics for the first session were abstract painting, book binding and rolled paper. The topics for the second session were drawing the live model, creating a mini-fanzine (magazine or photo book) and stained-glass painting. Each workshop was managed by two arts and culture facilitators who proposed interactive handmade art activities targeting creativity (abstract painting/drawing the live model), handicraft techniques (book binding/mini-fanzine), or fine motor skills (rolled paper and stained glass painting). Regardless of the weekly workshops' topics, they all adopted a consistent structure divided into three consecutive periods, including a presentation of the activity's objective, choice of medium and communication of technical advice to all participants. Among participants in the intervention group who completed the 3-month session of intervention (n=165), none missed a workshop.

2.4. Assessment

2.4.1. Baseline assessment

Baseline assessment was performed in a dedicated room at the MMFA before (M0) the first workshop. The computer proficiency questionnaire (CPQ) was used to assess ability to use a computer (18). Its scores range from 5 (i.e., never tried) to 30 (i.e., very easily). This information was collected on a paper form. For all subsequent collection of information, the CEEXLO's Web platform was used. The participants' socio-demographic characteristics (i.e., age, sex, ethnicity) were recorded. Frailty was assessed using the Centre of Excellence Self-Administered questionnaire (CESAM) (19). Using 20 close-ended questions, CESAM examines different subdomains of mental and physical health: weight loss; polypharmacy (i.e., number of therapeutic classes taken on a daily basis ≥ 5); vision, hearing and memory problems; home support; activities of daily living (ADL) and instrumental activities of daily living (IADL) (20,21); mood; practice of regular

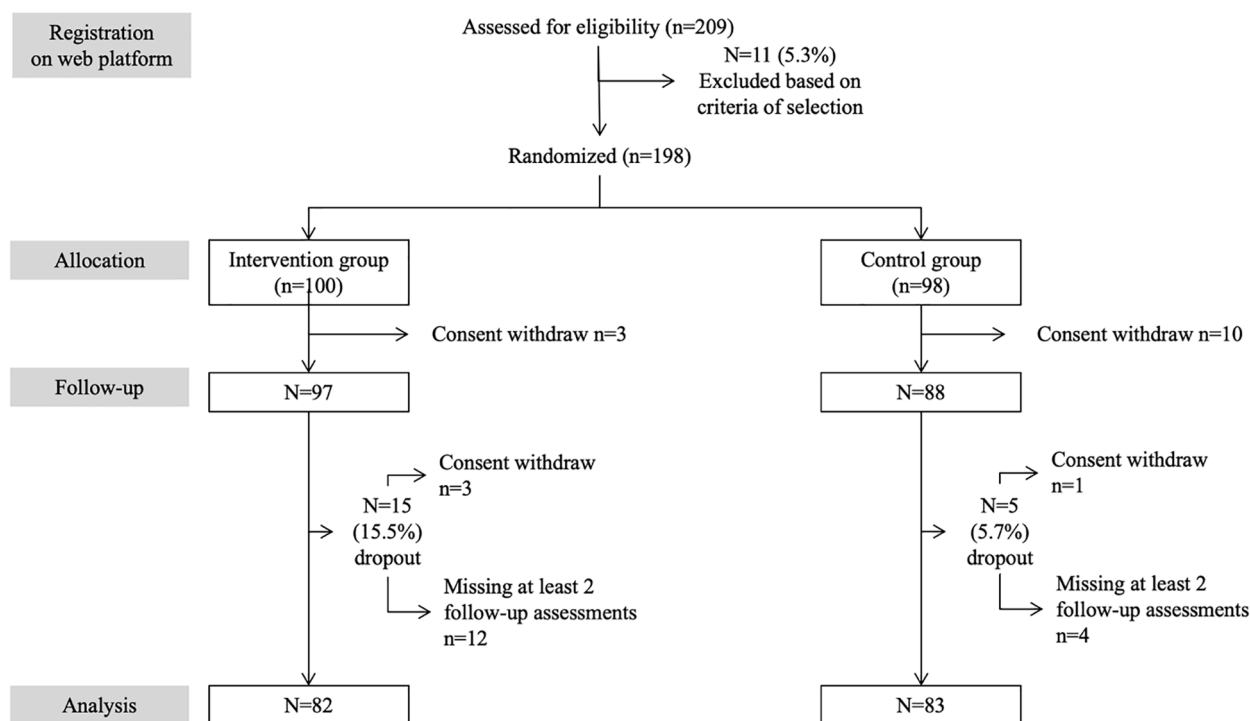


Figure 1. Consort flow diagram detailing selection and follow-up of participants in the RCT

physical activity; and history of falls in the past 12 months. CESAM was filled out by the participants themselves under the supervision of Principal Investigator representatives. Two measures were obtained: 1) a global frailty score ranging from 0 (*i.e.*, best health condition) to 18 (*i.e.*, worst health condition) and 2) a frailty stage, categorized as vigorous (score 0-3), mild frailty (score 4-7), moderate frailty (score 8-12) and severe frailty (score >12). EuroQol-5D (EQ-5D) was used to assess quality of life (22). This tool is composed of a questionnaire examining physical health issues, with scores ranging from 0 (*i.e.*, no issue) to 25 (*i.e.*, worst issue), and a visual analogue scale (VAS) assessing self-perceived health, ranging from 0 (*i.e.*, worst health imaginable) to 100 (*i.e.*, best health imaginable). Wellbeing was assessed using the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) self-administered questionnaire (23), which is composed of 14 positively worded items and produces scores ranging from 14 (*i.e.*, none of the time) to 70 (*i.e.*, all the time). All tools were available in French and English on the CEEXLO's Web platform. The reliability of these tools was observed over the period of the first experimental study, which included similar participants (15).

2.4.2. Follow-up assessments

CESAM, WEMWBS and EQ-5D questionnaires were repeated before the fifth (M1), ninth (M2) and twelfth (M3) workshops in the intervention group. The control group completed these questionnaires according to the same schedule. All questionnaires were filled out at home using the CEEXLO's Web platform with support by phone if needed.

3.5. Outcomes

The primary outcome was the mean CESAM score and the secondary outcomes were mean value of EQ-5D scores and the distribution of frailty categories (vigorous, mild, moderate and severe frailty) at M0, M1, M2 and M3.

2.7. Ethical considerations

Participants were included after giving written informed consent for research. The ethics committee of the Jewish General Hospital (Montreal, Quebec, Canada) approved the project (2019-1493).

2.8. Statistics

Means, standard deviations (SD), frequencies and percentages were used to describe participants' characteristics. Inter- and intra-group comparisons were performed using unpaired or paired *t*-tests, analyses of variance (ANOVA) with repeated measure design or Chi-squared tests, as appropriate. ANOVA with repeated measure design were performed to examine the effect of the participatory art-based activity on each questionnaire's scores (*i.e.*, CESAM, WEMWBS and EQ-5D scores) adjusted for time (*i.e.*, M0, M1, M2 and M3) and participants' baseline characteristics (*i.e.*, age, sex, ethnicity, home support, polypharmacy, scores of ADL and IADL, mood, practice of physical activity, history of falls in the past 12 months and the CPQ score). *P*-values less than 0.05 were considered statistically significant for linear regressions. All statistics were performed using SPSS (version 23.0; SPSS, Inc., Chicago, IL).

3. Results

There was no significant difference between groups for participants' baseline characteristics (Table 1). As shown in Table 2, there was a significant trend of decreasing EQ-5D questionnaire scores ($P \leq 0.002$) in the intervention group from M0 to M3. Inter-group comparisons showed that EQ-5D questionnaire ($P=0.018$) and VAS ($P=0.014$) scores were significantly lower in the intervention group compared to the control group at M3. At M1, the EQ-5D VAS score was also significantly lower in the intervention group compared to the control group ($P=0.007$). CESAM scores were lower in the intervention group compared to control group at M3 ($P=0.038$). Figure 2 shows the evolution in the proportions of participants with vigorous, mild and moderate frailty in the control and intervention groups from M0 to M3. The proportion of vigorous

Table 1
Baseline participant characteristics (n=165)

	Total Population (n=165)	Participants		P- Value*
		Control (n=83)	Intervention (n=82)	
Age (years), mean±SD	71.7±4.9	71.9±5.0	71.5±4.7	0.561
Female, n (%)	142 (86.1)	74 (89.2)	68 (82.9)	0.248
Caucasian, n (%)	147 (89.1)	73 (88.0)	74 (90.2)	0.637
Home support [†] , n (%)	4 (2.4)	2 (2.4)	2 (2.4)	0.990
Polypharmacy [‡] , n (%)	128 (77.6)	64 (77.1)	64 (78.0)	0.885
ADL score (/6) , mean±SD	5.9±0.4	5.8±0.5	5.9±0.3	0.118
IADL score (/4) [§] , mean±SD	4.0±0.2	3.9±0.2	4.0±0.2	0.714
Happy mood [¶] , n (%)	129 (78.2)	63 (75.9)	66 (80.5)	0.476
Practice of physical activity**, n (%)	150 (90.9)	73 (88.0)	77 (93.9)	0.184
History of falls in the past 12 months, n (%)	59 (35.8)	32 (38.6)	27 (32.9)	0.451
CPQ score (/30) ^{††} , mean±SD	24.6±2.8	24.8±3.0	24.5±2.7	0.469

SD: Standard deviation; ADL: Activities of daily living; IADL: Instrumental activities of daily living; CPQ: Computer proficiency questionnaire; *: Comparison based on unpaired *t*-tests or chi-squared, as appropriate; †: Receiving help from family, friend or professional for daily living activities; ‡: Number of therapeutic classes taken daily ≥ 5 ; ||: Ranging from 0 (dependent) to 6 (independent); §: Ranging from 0 (non-autonomous) to 4 (autonomous); ¶: Based on an answer to the question “How do you feel today?” with three possible answers, including unhappy, happy, neither one nor the other; **: Regular physical activity (walking, bicycle, etc.) at least one hour per week in the past month; ††: Ranging from 5 (never tried) to 30 (very easily)

participants decreased significantly ($P \leq 0.002$) in the control group and increased significantly in the intervention group from M0 to M3 ($P \leq 0.002$). Only the comparison at M3 between intervention and control groups showed that there were more vigorous participants in the intervention group than in the control group ($P = 0.016$). From M0 to M3, a significant increase in the proportion of mildly frail participants was observed in the control group ($P \leq 0.003$), whereas a significant decrease in the proportion of mildly frail participants was shown in the intervention group ($P \leq 0.012$). The proportion of mildly frail participants was lower in the intervention group than in the control group at M2 and M3 ($P \leq 0.016$). No significant changes to the proportions of moderately frail participants were reported for the intervention and control groups. Table 3 shows that participation in the intervention was significantly associated with improvements to frailty, well-being and quality of life ($P \leq 0.004$).

4. Discussion

The results show that a 3-month session of weekly “Thursdays at the Museum” at the MMFA may improve both physical and mental health in older Montreal community dwellers.

We suggest that the benefits observed in our RCT may be the result of participation in art-based activities like “Thursdays at the Museum” which reversed the frailty process, with more vigorous and fewer frail participants observed following a 3-month session. While this improvement to frailty is consistent with our previous study (15), the quality of the evidence represented by the current results is superior to that of the first study due to the adoption of an RCT design. Our findings are also consistent with the WHO European Regional Office review’s conclusion that frailty may be slowed down at its onset (1). This review showed that dance and listening to music may improve gait and balance performance, as well as aerobic endurance, muscle mass and body composition in older adults (1). Furthermore, studies which explored the effect of cultural engagement, which includes going to the theatre,

Table 2
Comparisons of mean values of well-being, quality of life and frailty scores, as well as of frailty categories, between control and intervention groups (n=165)

	Participants				Intervention (n=82)				Control versus intervention group P-Value*			
	Control (n=83)		Intervention (n=82)		Intervention (n=82)		Control (n=83)		Intervention (n=82)		Control (n=83)	
	M0	M1	M2	M3	M0	M1	M2	M3	M0	M1	M2	M3
Warwick-Edinburgh Well-being scale (/70) [†] before workshop, mean±SD	57.9±5.6	57.2±6.1	57.3±6.6	56.5±6.6	56.9±6.2	57.7±6.1	57.9±6.2	58.4±6.6	0.246	0.579	0.515	0.081
EQ-5D:												
Questionnaire score (/25) [‡] , mean±SD	6.4±1.5	6.5±1.3	6.4±1.3	6.4±1.3	6.7±1.7	6.6±1.7	6.5±1.8	5.8±1.8	0.359	0.544	0.669	0.018
Visual analogue scale (/100) , mean±SD	83.3±13.5	84.9±11.4	83.0±14.1	80.7±15.0	81.8±13.6	79.3±14.8	80.0±13.8	85.3±7.9	0.478	0.007	0.169	0.014
Frailty Score (/18) [§] , mean±SD	2.9±2.1	3.1±2.3	3.1±2.1	3.4±2.3	3.0±2.7	2.6±2.3	2.6±2.3	2.6±2.4	0.798	0.187	0.178	0.038

SD: Standard deviation; EQ-5D: EuroQol 5D; M: Month; M0: baseline assessment before intervention; M1: Assessment at the beginning of the second month; M2: Assessment at the beginning of the third month; M3: Assessment at the end of the 3-month intervention period; *: Comparisons based on two-way analysis of variance (ANOVA) with a repeated measure design; †: Ranging from 14 (i.e., none of the time) to 70 (i.e., all the time); ‡: Ranging from 0 (no problem) to 25 (unable to do); ||: Ranging from 0 (the best health condition) to 100 (the worst health condition); §: Mean score calculated from computerized self-administered questionnaire composed of 20 questions providing a score ranging from 0 (vigorous) to 18 (severe frailty); ¶: Comparison based on unpaired *t*-tests; significant *P*-values (i.e., < 0.05) in bold

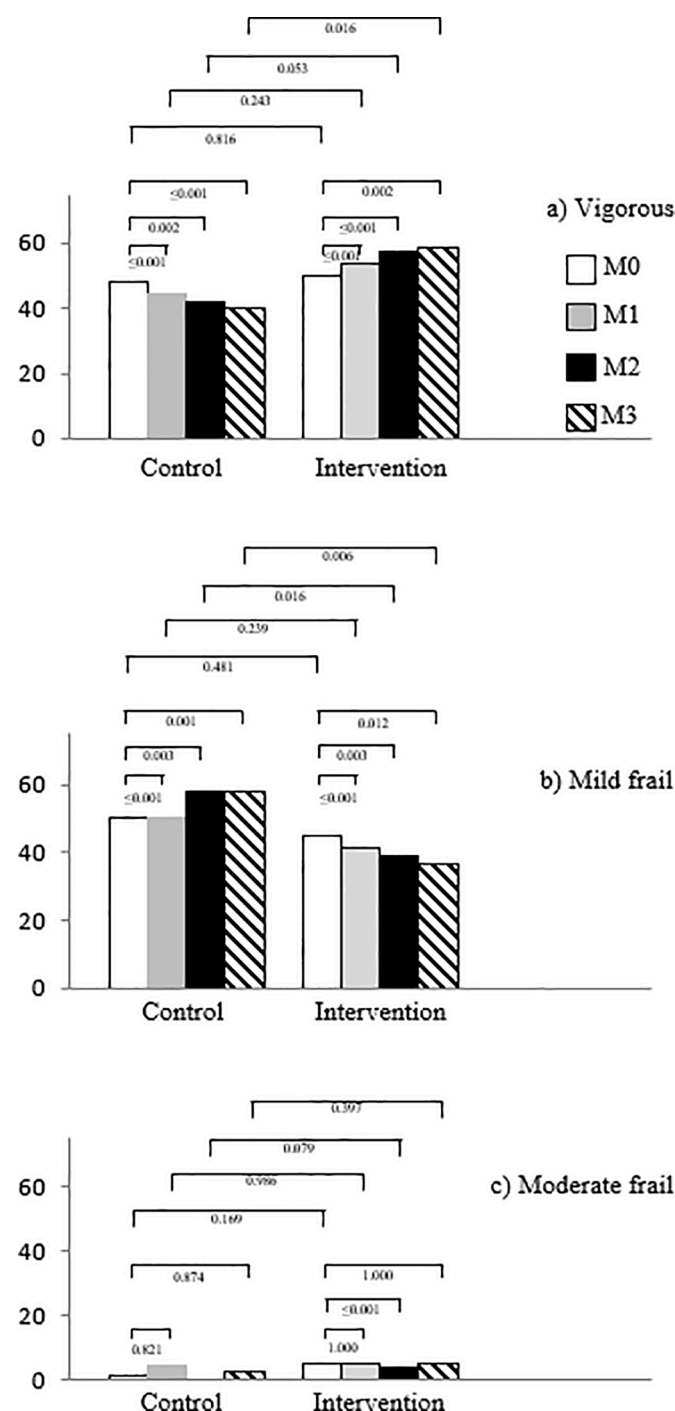


Figure 2. Evolution of frailty categories in control (n=83) and intervention (n=82) groups

concerts, museums or galleries and the cinema, revealed that it was possible to reduce older adults' risk of developing frailty or slow the rate of their frailty's progression (24).

Improvements to mental and physical health with art-based activities are not new observations, as exemplified by the art therapy field's therapeutic application of art-making (25–27). Improvements to well-being and quality of life have been reported in patients with cancer, neuropsychiatric diseases, or physical disabilities (1,27). Taken together, these and our results suggest that mildly frail older individuals may benefit the most from interventions engaging art-based activities. A causal explanation of these complex health benefits probably arises from an interaction between well-being, quality of life and physical health.

Table 3

P-values from repeated measures analysis of variance (ANOVA) estimating the effects of the intervention on mean Warwick-Edinburgh Well-being scale, EuroQol-5D and Centre of Excellence Self-Administered questionnaire scores adjusted for time and baseline participant characteristics (n=165)

	Effect Time*	Intervention
WEMWBS score	0.155	0.004
EQ-5D Score	0.567	0.002
VAS	0.609	0.001
CESAM score	0.290	0.002

WEMWBS: Warwick-Edinburgh Well-being scale; EQ-5D: EuroQol-5D; VAS: Visual analogic scale; CESAM: Centre of Excellence Self-Administered questionnaire; * Measure repeated four times during the 3-month period of intervention; significant P-values (i.e., <0.05) in bold

Indeed, a chronological sequence of health benefits has been suggested previously (1,15). The positive experiences engendered by art-based activities may improve well-being, which improves quality of life and, finally, physical health. The temporal evolution of the changes reported in our first study also support this hypothesis (15). In this study, well-being was enhanced at the end of each workshop when compared to the beginning, with the magnitude of this change being higher at the end of the 3-month session than at the beginning. In contrast, quality of life improved gradually throughout the full session. Lastly, the proportion of vigorous participants increased, whereas the proportion of mildly frail participants decreased when comparing the end of the 3-month session to the beginning.

Present findings also included improvements to well-being and quality of life in intervention group participants. Similar findings were previously reported in our first experimental study and other studies (15). These mental health benefits are usually explained through reference to the positive experience of an art-based activity leading to an improvement in self-esteem, confidence and mood (6,9,12,27). However, previous studies mainly focused on patients in medicalized settings and few showed improvements to well-being and/or quality of life in community-dwelling older adults (1,27). With aging, severe morbidities and disabilities tend to accumulate, leading to a vicious cycle of negative experiences and loss of self-confidence (2,3,4,28). “Thursdays at the Museum” may be an intervention that breaks this vicious cycle by generating positive emotions during art-based activities. Among other factors, this positive emotion may encourage older adults to interact with their environment, improving their quality of life.

The present study has limitations. First, it was carried out in only one center, which was the MMFA. Second, social isolation is prevalent in the older population and was shown to be associated with frailty (1,14). Thus, mental and physical health benefits may result from the breach in social isolation experienced during “Thursdays at the Museum”, which maintains consistent social interactions and can strengthen self-esteem. In our study, it is not possible to distinguish the effects attributable to the art-based activity itself from those of going to the museum, because our intervention combined the two. Third, the intervention was undertaken over two distinct sessions that differed in terms of the art-based activities proposed, which may expose participants to different effects despite the activities having been developed according to a single standardized process. Fourth, over the study period, the control group may have been exposed to various activities that influenced the outcomes. We suggest that this effect was limited by our control methods. Indeed, control group participants were asked to commit to withholding participation in art-related interventions for the study period, to avoid participating in social programs and to report any other activity practiced during the same time. No participants in the control group reported art-related or social program activities. However, this absence of participation in another group activity may increase the possibility that it was the participation in a group activity that had benefits in our study rather

than the participation in an art-based activity. In future experimental studies, it will be important to collect more detailed information on other activities practices by participants over the period studied. Fifth, participants were already visitors of the MMFA and, thus, were art enthusiasts, which limits the external validity of the study (*i.e.*, the degree to which the study's findings may be extrapolated to the general population). Sixth, there was a high proportion of women among participants and information on gender was not collected. Both of these variables may have influenced the results of our experimental study. Biological and social characteristics specific to sex and gender may differentially impact the outcomes we assessed. For instance, females' life expectancy is known to be longer than that of males; thus, females are prone to having a higher burden of medical comorbidities that may influence the outcomes of our experimental study. In addition, sex may influence the effects of diseases on health because of genetic or physiological variables that may change the severity of frailty experienced by females compared to males.

5. Conclusion

Our study suggested that the art-based activity "Thursdays at the Museum" may benefit the mental and physical health of older community dwellers. This art-based activity could be an effective solution for reversing frailty and preventing it at its onset, positioning museums as key stakeholders for health prevention in an aging population.

Contributors

Olivier Beauchet conceived of, designed and performed the experiments, collected, analyzed and interpreted the data, and drafted the manuscript.

Liam Cooper-Brown contributed to data collection and the revision of the manuscript.

Yoko Hayashi contributed to revision of the manuscript.

Melanie Deveau contributed to data collection and the revision of the manuscript.

Andy Hau Yan Ho contributed to revision of the manuscript.

Cyrille P Launay conceived of and designed the experiments, analyzed and interpreted the data, and contributed to revision of the manuscript.

Conflict of interest

The authors declare that they have no conflict of interest.

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Ethical approval

Participants were included after giving written informed consent for research. The ethics committee of the Jewish General Hospital (Montreal, Quebec, Canada) approved the project (2019-1493).

Provenance and peer review

This article was not commissioned and was externally peer reviewed.

Research data (data sharing and collaboration)

There are no linked research data sets for this paper. Data will be made available on request sent by e-mail to Dr Beauchet (olivier.beauchet@umontreal.ca).

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References

- [1] <https://www.euro.who.int/en/publications/abstracts/what-is-the-evidence-on-the-role-of-the-arts-in-improving-health-and-well-being-a-scoping-review-2019>.
- [2] G Berrut, S Andrieu, I Araujo de Carvalho, JP Baeyens, H Bergman, B Cassim, F Cerreta, M Cesari, HB Cha, LK Chen, A Cherubini, MY Chou, AJ Cruz-Jentoft, L De Decker, P Du, B Forette, F Forette, A Franco, R Guimaraes, LM Gutierrez-Robledo, J Jauregui, V Khavinson, WJ Lee, LN Peng, C Perret-Guillaume, M Petrovic, F Retornaz, K Rockwood, L Rodriguez-Manas, C Sieber, G Spatarakis, O Theou, E Topinkova, B Vellas, A Benetos, G Berrut, et al., Among authors: bergman h, rockwood k. Promoting access to innovation for frail old persons. IAGG (International Association of Gerontology and Geriatrics), WHO (World Health Organization) and SFGG (Société Française de Gériatrie et de Gériologie) Workshop-Athens January 20-21, 2012, J Nutr Health Aging 17 (2013) 688–693.
- [3] JE Morley, B Vellas, GA van Kan, SD Anker, JM Bauer, R Bernabei, M Cesari, WC Chumlea, W Doehner, J Evans, LP Fried, JM Guralnik, PR Katz, TK Malmstrom, RJ McCarter, LM Gutierrez Robledo, K Rockwood, S von Haehling, MF Vandewoude, J Walston, Frailty consensus: a call to action, J Am Med Dir Assoc 14 (2013) 392–397.
- [4] DS Kehler, T Ferguson, AN Stammers, C Bohm, RC Arora, TA Duhamel, N. Tangri, Prevalence of frailty in Canadians 18-79 years old in the Canadian Health Measures Survey, BMC Geriatr 17 (2017) 28.
- [5] http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwizptLjLvrAhUEWN8KHUxGDUIQFjAOegQIBRAB&url=http%3A%2F%2Fnetwork.icom.museum%2Ffileadmin%2Fuser_upload%2Fminisites%2Ficofom%2Fimages%2FDefining_the_Museum_of_the_Twenty-First_Century_-_Evolving_Multiculturalism_in_Museums_in_the_United_States.pdf&usg=AOvVaw0XUc6OWVZ9W2Ep4t7Btdsl.
- [6] JD Flatt, A Liptak, MA Oakley, J Gogan, T Varner, JH Lingler, Subjective Experiences of an Art Museum Engagement Activity for Persons With Early-Stage Alzheimer's Disease and Their Family Caregivers, American Journal of Alzheimer's Disease & Other Dementias (2015) 380–389.
- [7] S MacPherson, M Bird, K Anderson, T Davis, A. Blair, An art gallery access program for people with dementia: 'you do it for the moment', Aging Ment Health 13 (2009) 744–752.
- [8] C Eekelaar, PM Camic, N. Springham, Art galleries, episodic memory and verbal fluency in dementia: an exploratory study, Psychol Aesthet Creat Arts 6 (2012) 262–272.
- [9] M Mittelman, C. Epstein, Meet Me: Making Art Accessible for People With Dementia, Museum of Modern Art, New York, NY, 2009.
- [10] F. Rosenberg, The MoMA Alzheimer's project: programming and resources for making art accessible to people with Alzheimer's disease and their caregivers, Arts Health 1 (2009) 93–97.
- [11] LJ Thomson, B Lockyer, PM Camic, HJ. Chatterjee, Effects of a museum-based social prescription intervention on quantitative measures of psychological well-being in older adults, Perspect Public Health 138 (2018) 28–38.
- [12] A Jensen, LO. Bonde, The use of arts interventions for mental health and wellbeing in health settings, Perspect Public Health 138 (2018) 209–214.
- [13] https://www.academia.edu/27495203/Museums_for_Health_and_Wellbeing_A_Preliminary_Report_from_the_National_Alliance_for_Museums_Health_and_Wellbeing.
- [14] C Todd, PM Camic, B Lockyer, LJM Thomson, HJ. Chatterjee, Museum-based programs for socially isolated older adults: Understanding what works, Health Place 48 (2017) 47–55.
- [15] O Beauchet, T Bastien, M Mittelman, Y Hayashi, Yan Hau, A. Ho, Participatory art-based activity, community-dwelling older adults and changes in health condition: Results from a pre-post intervention, single-arm, prospective and longitudinal study, Maturitas 134 (2020) 8–14.
- [16] O Beauchet, L Cooper-Brown, Y Hayashi, K Galery, C Vilcoq, T. Bastien, Effects of "Thursdays at the Museum" at the Montreal Museum of Fine Arts on the mental and physical health of older community dwellers: the art-health randomized clinical trial protocol, Trials 21 (2020) 709.
- [17] D Moher, S Hopewell, KF Schulz, V Montori, PC Gøtzsche, PJ Devereaux, D Elbourne, M Egger, DG Altman, CONSORT. CONSORT 2010 explanation and elaboration: updated guidelines for reporting parallel group randomised trials, Int J Surg 10 (2012) 28–55.
- [18] WR Boot, N Charness, SJ Czaja, J Sharit, WA Rogers, AD Fisk, T Mitzner, CC Lee, S. Nair, Computer proficiency questionnaire: assessing low and high computer proficient seniors, Gerontologist 55 (2015) 404–411.

- [19] O Beauchet, CP Launay, C Merjagnan-Vilcoq, A Kabeshova, C. Annweiler, Quantified self and comprehensive geriatric assessment: older adults are able to evaluate their own health and functional status, *PLoS One* 9 (2014), e100636.
- [20] Best Practices in Nursing Care to Older Adults, The Hartford Institute for Geriatric Nursing, New York University, College of Nursing, www.hartfordnig.org.
- [21] K Pérès, V Chrysostome, C Fabrigoule, JM Orgogozo, JF Dartigues, P. Barberger-Gateau, Restriction in complex activities of daily living in MCI: impact on outcome, *Neurology* 67 (2006) 461–466.
- [22] R Tennant, L Hiller, R Fishwick, S Platt, S Joseph, S Weich, J Parkinson, J Secker, S. Stewart-Brown, The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS): development and UK validation, *Health Qual Life Outcomes* 5 (2007) 63.
- [23] P. Brooks, EuroQol: the current state of play, *Health Policy* 37 (1996) 53–72.
- [24] D Fancourt, A. Steptoe, Physical and psychosocial factors in the prevention of chronic pain in older age, *J Pain* 19 (2018) 1385–1391.
- [25] O Beauchet, S Remondière, M Mahé, F Repussard, F Decavel, C. Annweiler, Geriatric inclusive art and length of stay in acute care unit: a case-control pilot study, *J Am Geriatr Soc* 60 (2012) 1585–1587.
- [26] O Beauchet, C Launay, C Annweiler, S Remondière, L. de Decker, Geriatric inclusive art and risk of in-hospital mortality in inpatients with dementia: results from a quasi-experimental study, *J Am Geriatr Soc* 62 (2014) 573–575.
- [27] N Perruzza, EA Kinsella, Creative Arts Occupations in Therapeutic Practice: A Review of the Literature, *British Journal of Occupational Therapy* 73 (2018) 261–268.
- [28] AJ Yarnall, AA Sayer, A Clegg, K Rockwood, S Parker, JV. Hindle, New horizons in multimorbidity in older adults, *Age Ageing* 46 (2017) 882–888.