BMC Geriatrics

RESEARCH

Open Access

Inactivity is isolation: insights from a sedentary time intervention in assisted living

Irmina Klicnik[1*], Brianna Leadbetter[2], Milena Zdjelar[3], Danielle R. Bouchard[2], Jennifer L. Copeland[3] and Shilpa Dogra[1]

Abstract

Background As Canada's aging population continues to grow, a larger number of older adults will be residing in assisted living (residences with some on-site care and services). Research is needed to understand how to support *active aging* – defined as a combination of movement and social behaviours—in this unique living environment. In this study, we explored insights generated about active aging from older residents of assisted living who participated in an intervention designed to encourage standing breaks.

Methods This was a multi-method exploratory study. Residents of three assisted living facilities participated in a 12-week intervention called Stand When You Can. The Keele Assessment of Participation (KAP) was used to assess perceived levels of participation in various domains of assisted living at pre- and post-intervention. Focus group sessions were conducted to explore insights on active aging. Transcripts were thematically analyzed to generate themes and sub-themes.

Results A total of 18 residents (84.4 ± 6.8 years, 72% female), participated in the focus groups. KAP scores at pre-intervention were indicative of a high level of social participation within the residences. Five primary themes emerged from the focus group sessions: 1) intervention effectiveness, 2) physical and social engagement go hand in hand, 3) the congregate living environment can influence movement behaviour, 4) congregate living supports interpersonal relationships, and 5) personal preferences for solitary activity.

Conclusions The natural communal setting of assisted living, along with supportive staff, presents a valuable opportunity to promote active aging, which is a complex interplay of social and movement behaviour. Our preliminary findings suggest that in addition to supporting individual behaviour change, a comprehensive approach that addresses the environment, social engagement, and staff engagement is needed in this setting. Future interventions should consider addressing each of these components to facilitate successful behaviour change related to active aging.

Keywords Active aging, Qualitative study, Collective dwelling, Environmental intervention, Social engagement, Health promotion

*Correspondence:
Irmina Klicnik
Irmina.klicnik@ontariotechu.net
[1] Ontario Tech University, 2000 Simcoe St N, Oshawa, ON L1G0 C5, Canada
[2] University of New Brunswick, 90 Mackay Dr, Fredericton, NB E3B 5 A3, Canada
[3] University of Lethbridge, Lethbridge, AB T1 K3M4, Canada

Background

As the global population ages, more older adults (aged 65 and older) are moving into congregate living settings, which vary in terms of the level of care or services provided. *Assisted living*, that is, facilities that typically include support with activities of daily living on an as-needed basis, but have few on-site medical staff, is one such option. Assisted living is distinct from long-term care facilities that provide 24-h skilled nursing and more extensive personal care services [1]. Fewer than 2% of Canadians aged 65–69 reside in assisted living, but this figure increases to nearly 30% in those aged 85 and older [2]. In Canada, this number represents over a quarter of a million people [1]. As the proportion of people aged 85 and older grows, it is important to consider how best to support those in assisted living to ensure they can continue to engage in health-promoting activities and behaviours.

There are many ways in which residents of assisted living differ from older adults who remain in their homes. The move to assisted living is influenced by numerous factors, such as reduced accessibility in the current home, the desire for social activities, or the availability of amenities in assisted living [3–5]. Together, these factors contribute to distinct characteristics and preferences among residents of assisted living, setting them apart from older adults who reside in the community. For example, new onset or progression of chronic diseases like dementia mean that residents of assisted living are more likely to use hospital services [6]. In contrast, assisted living offers additional benefits to older adults compared to those dwelling in the community, including the highly valued balance of support and independence [7], and opportunities for social interaction due to the proximity to peers [8].

Despite these benefits, there are some concerns associated with moving into assisted living. Residents of assisted living are no longer required to do many of their previous activities of daily living, such as housekeeping and cooking [9, 10]. This creates an instantaneous shift in the patterns of *movement behaviours*, that is, a decrease in physical activity and an increase in sedentary behaviour. This is problematic as sedentary behaviour—any waking activity performed in a seated or reclined posture that requires low energy expenditure [11, 12]—is associated with a loss in physical function [13], which makes older adults even more dependent on care. Furthermore, sedentary behaviour is associated with a plethora of negative health outcomes [14], such as frailty [15], declining cognitive function [16], poor sleep quality, depressive symptoms [17], and all-cause mortality [18]. Thus, while assisted living provides important advantages to older adults, the increased support may inadvertently be leading to detrimental outcomes by facilitating increased time spent sedentary.

Data indicate that older adults engage in up to 10 h of sedentary time every day [19]; this number is hypothesized to be higher among those in assisted living [20]. Additionally, the COVID- 19 pandemic led to lockdowns, social distancing measures, and smaller group activities, further limiting movement behaviour opportunities among older adults [21]. For many, these changes have persisted despite restrictions being removed [22], and have also had detrimental effects on social behaviours.

Research suggests that among older adults, movement behaviour and *social behaviour* are inter-related [23–26]. For example, a study in Japanese older adults ($n = 1146$) found that an increase in social engagement was associated with a decrease in sedentary time [26]. Similarly, a study of Belgian older adults ($n = 431$) found that older adults who lived in highly walkable neighborhoods reported less overall sedentary behaviour and more interaction with neighbours [27]. Older adults who are socially engaged also tend to accumulate more physical activity [28], while including a social component in physical activity programming has been identified as a motivating factor for older adults to participate [29, 30]. Together, this suggests the presence of a bidirectional relationship between movement and social behaviours [25]. However, little work has been done to understand this relationship among older adults in assisted living. Clearly, there is an opportunity to influence one behaviour when intervening on the other. This inter-relationship is illustrated in Fig. 1.

Our definition of active aging emphasizes the interrelationship between movement and social behaviour; this aligns with the World Health Organization of healthy aging which emphasizes the ability to—meet basic needs, be mobile, build and maintain relationships, learn, grow, and make decisions, and contribute to society [31]. This model also emphasizes the importance of the environment, which aligns with our previously proposed Living Environments and Active Aging Framework, wherein active aging is influence by the environment in which older adults reside [25]. Little work to date has investigated these relationships in assisted living.

Few studies have explored strategies to reduce sedentary time within assisted living settings, with most focusing on the promotion of physical activity [10, 20] rather than targeting sedentary behaviour specifically. Regardless of the movement behaviour, these approaches have overlooked the impact on social behaviour, and the potential that intervening on social behaviour could have on reducing sedentary time. In Canada, assisted living environments often emphasize independence and social inclusion as goals of care [32]. In order to truly support these goals, we must better understand how to

Fig. 1 Active Aging. Movement behavior and social behavior each exist on a spectrum. Movement behavior ranges from sedentary time to physical activity of increasing intensities, while social behavior spans from social isolation to social engagement. We define active aging as the combination of social and movement behaviours

reduce sedentary time among older adults in assisted living. Based on our review and research, we believe that intervening on one can lead to changes in the other. As such, the purpose of this exploratory study was to generate insights into the interrelationship between movement behaviour and social engagement among residents of assisted living in Canada who participated in an intervention to reduce sedentary time.

Method

We followed the Consolidated Criteria for Reporting Qualitative Studies (COREQ) [33] to ensure thorough reporting, as this study included a qualitative component.

Theoretical foundation

The theoretical underpinning of this work is rooted in the social ecological model (SEM) [34], and Lawton's ecological model of aging [35]. The SEM is a widely recognized and effective approach for behaviour change, and was the basis for developing the intervention, from which a subsample of participants was drawn for the present study. This model acknowledges the multifaceted nature of health behaviours and interventions, emphasizing the importance of considering multiple levels of influence, including individual, interpersonal, organizational, and environmental factors [34]. It was also used to design the intervention [36] because it provides a holistic perspective that considers the complex interplay between individual behaviours (sedentary behaviour) and their broader assisted living social (staff and fellow residents) and environmental (physical environment, environmental cues) contexts. As such, intervention components were targeted to the individual, the staff, and the environment in the assisted living residences. Lawton's ecological model of aging [35] highlights the interaction between older adults and their environment, suggesting that changes in environmental conditions can influence behaviour and well-being. The intervention, which focused on environmental cues (such as point of decision prompts, and signage throughout common spaces in the residence) to reduce sedentary behaviour, aligns with Lawton's concept that the environment can be modified to enhance individual functioning [37]. By exploring the focus group discussions through the lens of Lawton's model, and the SEM, we can better understand the mechanisms through which altering environmental factors, such as promoting more active lifestyles, might positively affect social participation among older adults.

Research team

IK, who is a Therapeutic Recreation Specialist with experience working with older adults in hospital and long-term care settings, was a PhD candidate with an MHSc in Health Sciences, and 15 years of experience working with the older adult population. She led the in-person focus group in Ontario, and the virtual focus groups in New Brunswick (facilitated by BL) and Alberta (facilitated by MZ). SD, JLC, and DB are researchers in Kinesiology and Health Science with expertise in the area of sedentary time and aging. They were part of the team that developed the original intervention. IK and SD developed the interview guide based on the SEM, and conducted the

transcription analysis for the present study. MZ and BL were graduate students who recruited and hosted participants for focus group discussions.

Relationship with participants

Participants were not known to the researchers prior to the intervention. The focus group interviews were conducted by IK. Participants were informed of IK's professional background.

Study design, participants, and setting

We used a multi-method design; the quantitative component involved *pre- and post-intervention* assessments using the Keele Assessment of Participation (KAP), while the *qualitative descriptive* [38] component included *focus group* discussions which were analyzed using inductive thematic analysis [39]. Focus groups were conducted with participants who completed the Stand When You Can (SWYC) intervention in the fall of 2022. The results of the intervention effectiveness are available elsewhere [36], and the toolkit is available online [40].

Briefly, SWYC is a multi-level intervention designed to increase standing breaks and reduce prolonged sitting among older adults in assisted living. Adapted from previous pilot work [41], SWYC includes strategies at various levels of influence, including education for older adults, families, and staff, individual goal setting, environmental cues and supports, and social activities (e.g. games and standing breaks in regular activities). It is rooted in the SEM and targets changes in sedentary behaviour at the individual, social, organizational, and environmental levels. Staff working in assisted living, supported SWYC by using an online or printable version of the toolkit, making it a "hands-off" approach, with minimal researcher involvement. The toolkit was also available to the residents, and their family members to encourage engagement at all levels of the SEM. The intervention took place over a 12-week period, with a mid-way check-in at 6 weeks to address any concerns that came up, and was implemented across five sites in three mid-sized Canadian cities (Alberta, New Brunswick, and Ontario).

Eligible participants were residents of assisted living aged 65 or older, who participated in the SWYC intervention.

Measures and analysis

Participants completed brief pre-intervention testing, including a survey indicating their age and sex. The Keele Assessment of Participation (KAP) [42], was completed at pre-intervention and after the 12 week intervention (post-intervention). The KAP is used to gather data on participation restriction, and has been shown to have good construct, content, and face validity for use in adults aged 50 + [42]. The KAP is an 11-item self-scored questionnaire developed for the general population, which comprehensively measures participation in the domains of mobility, self-care, domestic life, interpersonal interaction, major life areas (including education, work, and money management), community, and social life [42]. Each item has 5 response options, which are coded to indicate either no restriction (score of 0) or presence of restriction (score of 1). Responses of "all of the time" and "most of the time" are coded as 0 (no restriction), while responses of "some of the time", "a little of the time", and "none of the time" are coded as 1 (presence of restriction). The responses for each item are summed, resulting in a total score that reflects the number of participation restrictions experienced by an individual. A higher total score indicates a greater number of domains in which the person faces participation restrictions, while a lower score suggests fewer or no restrictions in participation.

For the purposes of this study, particular attention was paid to items 11a (*Do you take part in social activities?*) and 11b (*If yes, during the past 4 weeks, have you taken part in social activities as and when you have wanted?)*, which directly query participants' engagement in social activities. The questionnaire was completed by the researcher or research assistant and participant together to ensure consistency in completion and understanding. A Wilcoxson signed-rank test was used to evaluate KAP scores from pre- to post-intervention, and a rank-biserial correlation was calculated to assess effect size (r) using R [43, 44].

Qualitative (Focus Group) data and analysis

Focus groups were conducted after completion of the intervention, either online or in person, with at least one facilitator and one note-taker. Out of five participating facilities, three agreed to participate in focus groups. Participants were invited to sit around a table or in a circle, with an audio recorder and the interviewing researcher (IK), using the interview developed by IK and SD based on the SEM (Fig. 2). At the Ontario site, IK conducted an in-person focus group; the focus groups in Alberta and New Brunswick were organized by MZ and BL, respectively, and were conducted as virtual focus groups using online video conferencing (Google Meet) by IK. Questions were asked broadly, to give each participant an opportunity to respond, and participants were given the opportunity to offer their own thoughts at the end of the session in case they did not feel the questions accurately captured their views. Transcribed audio data were not returned to the participants because it was de-identified [45]. The main guiding questions used in the focus groups are listed below.

1. Describe what social activity means to you?What kind of social activities do you engage in?
2. Do you feel that any of the intervention changes (prompt with examples if needed) impacted your social activity?
3. Do you think that social activity influences sitting, standing, or moving around in a residence like the one you live in?
4. What else influences whether you sit/stand?
5. What are some ways you think we could improve social activity and daily movement in your residence?
6. *If applicable*: Your residence was recently on lockdown for a COVID-19 outbreak within the residence – did you use what you learned through the intervention to help keep you mobile?

Fig. 2 Interview Guide

Table 1 KAP score results

	n	Pre-intervention	Post-intervention
Total score, median (IQR)	18	0 (0)	0 (2)
Item 11b, median (IQR)	15	0 (0)	0 (0)

IQR Interquartile range

Transcribed audio was reviewed independently by IK and SD, and key themes were extracted from transcript data via inductive thematic analysis [46]. This process involved initial open coding, where recurring concepts and phrases were identified across transcripts by IK and SD. These codes were then organized into broader categories, leading to the development of key themes. A consensus approach was used to discuss major themes, and resolve any disagreements.

Results

Survey data

From the full sample of participants in the SWYC study with complete pre- and post-intervention data ($n = 32$), a sample of 18 participants agreed to attend the focus group sessions specifically for the purposes of this study. Participants had a mean age of 84.4 ± 6.8 years at pre-intervention, and 72% were female. Table 1 provides KAP scores from the participants at the beginning and end of intervention. Question 11b (*...during the past 4 weeks, have you taken part in social activities as and when you have wanted?)*, was answered only if the participant responded 'Yes' to 11a *(Do you take part in social activities*), and response rate for this question was 83% at pre-intervention, and 94% at post-intervention. Participants who answered 'no' to item 11a at post-intervention, had no response for 11b, but these participants were still included in focus group discussions.

Overall, 14 (77.8%) participants had no restrictions in participation at pre-intervention, compared with 10 (55.6%) at post-intervention. Given the skewed distribution, a non-parametric test was used. The Wilcoxson signed-rank test revealed no difference between KAP scores from pre-intervention to post-intervention ($W = 14.0$, $Z = -1.69$, $p = 0.405$), but the rank-biserial correlation calculated to assess the effect size ($r = 0.51$) indicates that there was a moderately strong effect of the intervention on the KAP scores. There were no differences in scores on item 11b ($p = 1.00$), as all responses were coded as 0 (indicating no restriction) in this domain, thus effect size was not calculated for item 11b.

Focus group data

The number of participants varied by site ranging from 2–9 participants. The focus groups lasted approximately 12–40 min each, depending on the size of each group. Five major themes, with notable subthemes emerged from the focus group data, and are presented in Table 2.

Theme 1: intervention effectiveness

Participants commented on the impact of the intervention. In some cases, the impact was positive indicating that the intervention was successful; in other cases, the impact was negligible suggesting the intervention may not have been effective. Successful and ineffective aspects of the intervention are highlighted below.

Table 2 Focus group themes and subthemes

Theme	Subtheme
1. Intervention effectiveness insights	a. Successful aspects of intervention b. Ineffective intervention strategies
2. Physical activity and social engagement go hand in hand	a. Participants associate social engagement with physical activity b. Participants associate sedentary time with social isolation
3. The congregate living *environment* can influence movement behaviour	a. Assisted living policies impact social and physical participation b. Assisted living staff are an important influence
4. Congregate living supports *interpersonal* relationships	a. Participants place a high value on relationships within assisted living- b. Non-participating residents are viewed as inactive and isolated
5. Personal preferences for solitary activity (*intrapersonal*)	(no sub-themes)

Most participants did not report an increase in their social activity after the intervention to reduce sedentary time. The most commonly cited positive outcome of the intervention was *awareness* of their sedentary behaviour, rather than a direct change in their social engagement. For example, when asked about the impact of the intervention, one participant offered "*The only word I can use is "awareness". But it didn't necessarily mean I got moving more.*" (Male). Several participants commented on how the environmental cues (e.g. posters, floor stickers) spawned awareness of how sedentary they are, but it was not clear that it caused a behaviour change in their social participation. One participant stated that "*you see [table tent cards] you know, it keeps it in the forefront of your mind.*" (Female). Another participant added that "*all it did was make me more aware of the fact that I'm sitting on my butt, and so you get going. That's all I did,*" (Female) indicating that although the intervention caused her to increase movement, it did not impact her social activity due to a personal preference for solitary activities discussed in theme 5.

Despite the perceived benefits related to movement awareness, participants did not observe significant changes in their social participation, which suggests that while the intervention was effective in raising awareness of sedentary behaviour, it did not effectively address the social aspects of activity that are crucial for enhancing social engagement.

The only strategy perceived as *ineffective* by participants was the use of standing tables at one site; *"I don't like those tables. First of all, I'm too short"*. (Female) However, there were some positive comments about standings tables as well, including that they piqued the interest of participants who liked to look at magazines and newspapers which were regularly displayed on the tables. During the mid-way check in which took place at each site, activity directors indicated that rather than using the games suggested in the workbooks, they were able to incorporate standing into existing activities.

Theme 2: physical activity and social engagement go hand in hand

The SWYC intervention primarily encouraged standing breaks and offered a toolkit with suggested activities, but we did not track which activities participants engaged in, as this approach was intended to mimic real-life conditions. The residents spoke about many activities that fell outside the scope of the intervention (e.g., walking with friends), highlighting how they integrated social interactions with their physical activities in daily life. When asked about their social activity, participants listed activities which were physically active in nature. The first subtheme that emerged was that *participants associate social engagement with physical activity*. For example, when asked what type of social activities they participate in, participants responded with "walking club", "bocce ball", "bowling", "exercise class", and "garden club" among others. Some sedentary activities were also listed, such as "coffee hour", "knitting club", and "cards", as well as mixed ability activity (music and dance), which was listed as a very popular activity that participants could enjoy passively (sitting, listening to music) or actively (dancing).

Participants also *associated social isolation and sedentary behaviour*. Specifically, participants noted that external factors like weather and COVID- 19 restrictions resulted in general decline within the assisted living residence, precipitated by being forced to stay indoors or being relegated to one's own room or floor.

> *"…they're used to sitting there [in their own rooms] through COVID. Now that's their thing. They're creatures of habit." (Female)*

Examples of the reverse were also given:

> *"…there's a lot of people that are disabled [sic] even though this [community] is independent living, who don't come down for exercise because they can't." (Female)*

This may indicate that there was a belief that decreased physical function contributed to isolation, and it was viewed as a natural outcome of the aging process within this context. When asked if there were any strategies that could help support isolated individuals, another participant stated:

> *"I don't think that would do any good. The ones that are gonna [sic] come down are the ones that gonna [sic] make the effort…The ones that are mobile." (Female)*

The sentiment expressed by this participant aligns with Lawton's model, where physical competence (mobility) is implied as a key factor in influencing social connectivity among the residents.

Theme 3: The congregate living environment can influence movement behaviour

Much of the discussion in all three focus groups revolved around barriers and facilitators to social participation based on existing structures within their residence. A subtheme emerged emphasizing how *assisted living policies* related to scheduling and program offerings influence residents'opportunities for physical activity, reduction of sedentary time, and engagement in social participation. For example, at two of the sites, participants noted that limited staffing on weekends resulted in less social engagement and physical activity. In a discussion between three participants, one noted "*you can feel the difference on the weekend because all of the activities are done, you just have bowling on Saturday*" (Male). Barriers to participation in existing offerings included time of day, and personal responsibilities such as taking care of a spouse, or regularly scheduled medical appointments. Regarding early morning activity offerings, one participant stated, "*personally I don't participate in any of those, its 9 o'clock in the morning so it's too early for me*."(Female). All participants confirmed that the exercise programs offered at their residence are seated.

The *influence of staff* was another subtheme underscored by all three groups, who expressed a positive opinion of activity directors, and recreation staff particularly in their ability to influence participation behaviour. Participants spoke favorably of the recreation staff, commenting that they were "doing their best", "working very hard here to make things that everybody can join in," and described them as "great people". Highlighting the influence of staff on participation in activities, one participant noted:

> *"I really notice when [activity director] is away, right, and she ask me sometimes to lead exercise down here, there's maybe 5 or 6 people maybe turn up, 6, 7. But when she's down here, the whole area is just full!" (Male)*

Another participant, who attributed his own social relationships to the activity schedule developed by the activity director, stated that:

> *"I think the activities set up…what [activity director]'s got. It brings us together, and we have interaction. So I can remember a lot of the names of the people around, right? I haven't been here for a very long time, probably about a year and a half, right? And uh, I think that sort of thing brings the group together. We may not wanna go and visit each other in the apartments, but at the same time, when we're together, we get to know each other." (Male)*

Towards the end of the session, when asked about how social participation and movement can be increased in assisted living, one participant noted that starting with the activity director would be beneficial as she "can influence what [residents] do", highlighting their key role in organizing events, encouraging participation, and creating opportunities for residents to engage in activities that promote both movement, and social engagement.

Theme 4: congregate living supports interpersonal relationships

The interpersonal aspect of community living was the most discussed, especially in how the congregate living environment supports social participation, as well as the social hierarchy formed within. For the first subtheme, participants put a lot of *value on the relationships* that they have made in their respective residences. Regarding the isolating experience of COVID- 19 lockdowns, one participant described how her daily cross-corridor visit with a neighbor made an impact on her well-being. She said:

> *"… at 6 o'clock at night we used to open our doors... she open [sic] her side and we'd stand, and we waved to each other. And you have no idea how important that was." (Female)*

Another participant reflected on how the loss of a friend in the residence had impacted her social activity:

> *"Mostly we laughed, and I miss her terribly because she came in here just after me, we both happen to be active Catholics and we were interested in the chapel, and we got involved that's how it started… All these activities, and they've all dropped out of my life and it's very difficult." (Female)*

Participants also spoke about how their friends in the residence influenced them to participate in social activities that were new:

> *"[my friend] particularly liked music so I got involved in musical things which I never did before. But it's having companions, this is most important." (Female)*

A second subtheme was prevalent across the three sites, wherein participants who are older, or who are perceived by others as *non-participating, are viewed as inactive and isolated*. One participant stated:

> *"I think there's a lot of people that when they come in here, they're fairly elderly and declined. And after they've been here for a while, they're not getting younger, they're not getting more 'able', so they're not taking part in things". (Female)*

Efforts had also been made by participants to engage non-participators,

> *"Most of the people sit…a lot of the residents stay in their room most of the day. They come down for a meal and then they're back in their room. So I don't know how you're going to change that. I have tried, with some [of the] older people.". (Male)*

Theme 5: personal preferences for solitary activity (intrapersonal)

Participants spoke about their inclination for doing activities on their own, revealing a theme around personal preference. Due to the collective understanding of social activity as involving a component of physical activity, numerous participants mentioned engaging in individual activities like walking and exercising, which may not involve social interactions. This individual tendency towards activities such as walking and exercising alone aligns with Lawton's Ecological Model of Aging, which posits that behaviour is a function of the person-environment interaction [47]. For example, when asked about what type of social activities they do, one participant responded, "*Oh I'm doing some walking, but you know, not with a group, just take off and do my own thing in the woods.*" (Male) However, participants took pride in sharing these pursuits, stating:

> *"I kind of do my own activities every day. I go in the treadmill, and I go on the [vibrating belt exercise machine]… But it's good for you. Gets your blood flowing so I'll try it." (Female)*

Discussion

The purpose of this study was to better understand the interrelationship between movement behaviour and social behaviour among residents of assisted living after participating in a sedentary time reduction intervention. Our primary finding was that older adults in assisted living conflate social participation with physical activity, which became central to the focus group discussions, and has implications for how to foster active aging in assisted living. We also observed that staff interaction, and a sense of belonging with their peers, are key factors in promoting social participation, and that environmental cues to reduce sedentary time may not be sufficient on their own to increase social participation. These findings provide several interesting insights for the future development of interventions targeting healthy, active aging among older residents of assisted living.

Focus group discussions revealed that older adults consider movement to be an important aspect of social engagement, and that decreased movement behaviour is indicative of social isolation. This is consistent with previous research, which showed that older adults gain social benefit from participation in group exercise activity [48, 49], and that sedentary behaviour is viewed as acceptable only in a social context [50]. This finding confirms the importance of including a social aspect in interventions targeting movement behaviour, consistent with earlier research [51–53]. Although this finding may be specific to older adults who self-select to join such activities, i.e., those who enjoy social activities. Residents who do not consider themselves "joiners", but wish to remain active, may need different supports. Indeed, this bidirectional relationship underscores that the success of interventions may be improved by incorporating a social aspect in programs that promote movement, and by integrating movement into programs aimed at increasing social participation.

This is the first study to use the KAP in an assisted living sample, and given the potential limitations in this scale's sensitivity and relevance to this setting, the quantitative assessment of changes in social participation following the intervention should be considered preliminary. It has previously been used and validated in community dwelling older adults [42, 54]. There is a possibility that the questions may not be entirely pertinent to the unique dynamics of an assisted living setting, or the scale lacks the sensitivity to assess participation restrictions there. The KAP is usually used to score a 4-week period prevalence of participation restriction, and the SWYC study took place over 12 weeks, which may have also impacted the results because the KAP has not been validated or tested for measuring participation restrictions over a longer 12-week period, potentially leading to

inconsistencies in capturing changes over time. The initial KAP scores at pre-intervention were indicative of a supportive social environment, in other words, one that matches the needs of its residents well. This was a welcome finding, but did not leave room for improvement of scores and therefore we were not able to quantify the change in social participation brought on by the SWYC intervention.

Although the Wilcoxon Signed-Rank Test indicated no statistically significant change ($p = 0.405$), the effect size ($r = 0.51$) suggests a substantial increase in restriction levels from pre-intervention to post-intervention, indicating a meaningful change over the intervention period. The *increase* in scores between pre-intervention and post-intervention was surprising, but when responses for individual items on the KAP were explored further, it was clear that the increased scores could be attributed to the lockdown at the Ontario site, which was lifted only a few days prior to post-intervention. There was a trend in increased restrictions that could be attributed to residents being sequestered in their apartments; five out of nine participants indicated participation restrictions in meeting with and speaking to other people, and four indicated restrictions in leaving or moving around their home as and when they wanted to. This likely contributed to a larger effect size, so the results must be interpreted with caution. In the community setting, older adults have to navigate higher levels of environmental press, that is, more complex social and physical environments on their own, which may result in a wider range of responses. Conversely, in assisted living, many of these challenges are mitigated by the support services provided. For example, in a cross-sectional study of 7878 community-dwelling participants from a postal survey in the United Kingdom, 48% had a 4-week period prevalence of no participation restrictions [54], compared to 87% of our sample with no restrictions. Thus, more relevant and sensitive tools may be needed to assess social participation when working with older adults in assisted living, such as ones that examine the objective aspects like frequency and variety of activities, or subjective aspects like satisfaction.

Although participants did not perceive the connection between the intervention and an increase in their social participation, it is possible that the supportive environment of congregate living may have already facilitated their social engagement, which could have masked the true effect of the intervention. A key concept in Lawton's ecological model of aging is that an individuals' functional ability will affect the extent to which environmental changes further affect their function [37]. The design of assisted living residences is structured to provide communal spaces and organized activities, fostering natural social interaction among residents, but residents of assisted living are also generally independent and may already be more inclined to be more socially and physically engaged. The interpersonal aspects of themes arising from focus group discussion (themes 3 and 4) highlight not only the individual's choice, but also that by engaging with their environment in a meaningful way, their competency within the environment is strengthened, which according to Lawton's model, can beget further social engagement [35]. This is corroborated by the KAP scores at the beginning of the intervention, which were already indicative of active engagement in various domains of living, and previous research on baseline social engagement as a factor in the success of physical activity interventions [51, 55]. An interesting direction for future research, therefore, may be to assess KAP scores before and after the transition to assisted living as this would allow for a better understanding of how the assisted living environment addresses older adults' social engagement needs compared with their home environment. The influence of staff was also an important theme in this study, which is consistent with previous findings that positive social attention can increase residents of assisted living' participation in social activities within the residence [56]. The congregate living environment, together with supportive staff, represent the environmental and interpersonal factors which must be considered in active aging research.

The focus group discussions showed that the social environment (presence of supportive staff, and friends) is highly valued among the residents of assisted living, which reinforces the need for using a social-ecological approach to examining active aging in this setting. Residents referred to recreation staff such as activity directors during focus groups, but did not explicitly comment on the role of nursing or other support staff. This may be because the participants in the study were generally more independent, and therefore had less frequent interactions with nursing staff or personal support workers. However, it is likely that these types of staff have a more significant influence on residents with higher levels of need, who may rely more on their support for daily activities. As such, future interventions aimed at reducing sedentary time should continue to leverage staff influence within the residence to facilitate success.

This study has some notable strengths and limitations. The multi-site approach was a major strength, as Canadian assisted living residences vary between provinces. The inclusion of sites from three provinces allowed us to capture the diversity across different environments and regional factors that may influence our outcomes, thereby enhancing the generalizability of our findings. Another strength was the ease of administration. The positive feedback from staff during the mid-way check-in

affirmed the practicality and feasibility assessed in the pilot study [41], and indicated the potential for scaling the intervention to encompass larger participant cohorts. Scale-up may also support recruitment of more diverse samples. For example, only 18% of the study participants in the SWYC intervention were male, compared to the actual demographics of Canadian assisted living residences where approximately 30% are male [57]. The low ratio of males to females, which does not match the actual ratio of males to females in assisted living in Canada was typical for similar studies on sedentary behaviour or in assisted living, however the focus group participants reflected a closer balance, with 28% male participants.

Another key limitation of this study was that two of the three sites experienced lockdowns due to COVID-19 outbreaks within their residences. This not only impeded the overarching SWYC intervention (e.g. no opportunities for staff to reduce sedentary time in group activity settings), but also reduced residents' ability to maintain social engagement on their own, as residents were required to remain in their rooms for health and safety considerations during the outbreak. Though the change in KAP scores was non-significant, it highlights a noticeable impact of lockdown measures on residents' daily lives. The KAP provided no insight into the reasons for participation restriction, limiting our ability to understand the factors influencing social engagement in this context. With only 56% of participants who completed the post-intervention tests opting to join the focus groups, there is a potential for selection bias. The sample, consisting solely of independently mobile residents living in an assisted living environment, limits the generalizability of our findings to less mobile or more diverse populations.

While the intervention did not lead to measurable increases in social engagement on the KAP measure in our participants, it is possible that it would have been effective in individuals with lower social engagement at baseline. It is challenging, however, to determine the full impact of the intervention on social engagement, as many participants were already socially active, and because of the COVID lockdowns. This suggests that while the specific intervention may not have directly increased social engagement, there remains a need to explore strategies for fostering and sustaining meaningful social connections in these settings. This intervention could be considered for implementation in independent living settings, where residents might receive less support compared to assisted living environments, and where the need for social connection could vary depending on the levels of independence. A possible future direction for this research is also to include the staff (e.g. recreation, nursing), as they can be considered as part of the living environment for older adults in assisted living. Future research is also needed to understand sex and gender differences, as well as the impact of such an intervention on older adults from diverse cultural backgrounds.

Conclusions

In conclusion, an intervention aimed at reducing sedentary time in residents of assisted living was well-received and suggested an inter-relationship between movement and social behaviours. Our findings underscore the complexity of active aging within the assisted living context, highlighting the interwoven nature of social and movement behaviours. The discussions from our focus groups reinforce that environmental cues to reduce sedentary time, coupled with the inherent communal nature of assisted living, can serve as passive encouragements for both social engagement and physical activity. The findings also suggest that fostering active aging requires a multifaceted approach that goes beyond environmental adjustments to include social opportunities and staff engagement. Importantly, our findings advocate for the refinement of these environmental factors to further enhance active aging among residents. Together with supportive staff, and the valued sense of community among peers, these elements can be harnessed to enrich the experience of aging in this setting.

Abbreviations

AB	Alberta
KAP	Keele Assessment of Participation
NB	New Brunswick
ON	Ontario
SEM	Social Ecological Model
SWYC	Stand When You Can

Acknowledgements

We would like to acknowledge the staff at the assisted living residences, who helped to make this research possible. We would also like to acknowledge Rogih Andrawes, and Roubir Andrawes, the undergraduate students who assisted with data collection, and focus group transcriptions.

Authors' contributions

JLC, DRB, and SD conceptualized SWYC program. IK and SD developed methods for focus groups, social participation outcomes, and collected data at ON site. MZ and BL collected data at AB and NB sites, respectively. All authors read and approved the final manuscript.

Funding

This study was funded by a Catalyst Grant (# 45746–4175 -8001).

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

This study was reviewed and approved by the Ontario Tech University Research Ethics Board (REB# 16564), and informed consent was obtained from all participants.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 15 January 2024 Accepted: 9 April 2025
Published online: 25 April 2025

References

1. Statistics Canada. Type of collective dwelling and collective dwellings occupied by usual residents and population in collective dwellings: Canada, provinces and territories. 2022.
2. Statistics Canada. A portrait of Canada's growing population aged 85 and older from the 2021 Census. 2022.
3. Franco BB, Randle J, Crutchlow L, Heng J, Afzal A, Heckman GA, et al. Push and pull factors surrounding older adults' relocation to supportive housing: a scoping review. Can J Aging. 2021;40(2):263–81.
4. Rockwood JK, Richard M, Garden K, Hominick K, Mitnitski A, Rockwood K. Precipitating and predisposing events and symptoms for admission to assisted living or nursing home care. Can Geriatr J. 2014;17(1):16–21.
5. Franco BB, Randle J, Crutchlow L, Heng J, Afzal A, Heckman GA, et al. Push and pull factors surrounding older adults' relocation to supportive housing: A scoping review. Can J Aging. 2021;40(2):263–81.
6. Manis DR, Poss JW, Jones A, Rochon PA, Bronskill SE, Campitelli MA, et al. Rates of health services use among residents of retirement homes in Ontario: a population-based cohort study. CMAJ. 2022;194(21):E730–8.
7. Croucher K. Making the case for retirement villages: Joseph Rowntree Foundation York; 2006.
8. Heisler E, Evans GW, Moen P. Health and social outcomes of moving to a continuing care retirement community. J Hous Elder. 2003;18(1):5–23.
9. Sebastião E, Pak J, Benner D, Nakamura PM, Papini CB. Magnitude and composition of sedentary behavior in older adults living in a retirement community. J Community Health. 2019;44:805–14.
10. Voss ML, Pope JP, Copeland JL. Reducing sedentary time among older adults in assisted living: perceptions, barriers, and motivators. Int J Environ Res Public Health. 2020;17(3):717.
11. Sedentary Behaviour Research N. Letter to the editor: standardized use of the terms "sedentary" and "sedentary behaviours". Appl Physiol Nutr Metab. 2012;37(3):540–2.
12. Tremblay MS, Aubert S, Barnes JD, Saunders TJ, Carson V, Latimer-Cheung AE, et al. Sedentary Behavior Research Network (SBRN) - Terminology Consensus Project process and outcome. Int J Behav Nutr Phys Act. 2017;14(1):75.
13. Rojer AGM, Denneman BCM, Brouwer P, Ramsey KA, Trappenburg MC, Meskers CGM, et al. Determinants of instrumented sedentary and physical activity behavior in geriatric rehabilitation inpatients: RESORT. Experimental gerontology. 2021;154:111524-.
14. Copeland JL, Ashe MC, Biddle SJH, Brown WJ, Buman MP, Chastin S, et al. Sedentary time in older adults: a critical review of measurement, associations with health, and interventions. Br J Sports Med. 2017;51(21):1539-.
15. Kehler DS, Theou O. The impact of physical activity and sedentary behaviors on frailty levels. Mech Ageing Dev. 2019;180:29–41.
16. Raichlen DA, Klimentidis YC, Sayre MK, Bharadwaj PK, Lai MH, Wilcox RR, et al. Leisure-time sedentary behaviors are differentially associated with all-cause dementia regardless of engagement in physical activity. Proc Natl Acad Sci. 2022;119(35):e2206931119.
17. da Costa ME, Cândido LM, de Avelar NCP, Danielewicz AL. How much time of sedentary behavior is associated with depressive symptoms in community-dwelling older adults in southern Brazil? Geriatr Nurs. 2023;50:25–30.
18. de Rezende LF, Rey-Lopez JP, Matsudo VK, do Carmo Luiz O. Sedentary behavior and health outcomes among older adults: a systematic review. BMC Public Health. 2014;14(1):333.
19. Harvey JA, Chastin SFM, Skelton DA. Prevalence of sedentary behavior in older adults: a systematic review. Int J Environ Res Public Health. 2013;10(12):6645–61.
20. Vos CM, Ambrose-Gallagher N, Webster KE, Larson JL. Physical activity and sedentary behavior of residents in assisted living: a preliminary study. Res Gerontol Nurs. 2022;15(3):117–23.
21. Cosco TD, Wister A, Riadi I, Kervin L, Best J, Raina P. Reduced ability to engage in social and physical activity and mental health of older adults during the COVID-19 pandemic: longitudinal analysis from the Canadian Longitudinal Study on Aging. Lancet (British edition). 2021;398:S35-S.
22. DeJohn AD, Widener MJ, Wilson K, Mihailidis A. " It's not at all the same as being in the same room, being in the same space": Older adult technology use and activity place modification during COVID-19 lockdown. SSM-Qual Res Health. 2024;5:100401.
23. Hackney ME, Creel T. Social and Cultural Influences on Physical Activity. In: Sullivan GM, Pomidor AK, editors. Exercise for Aging Adults: A Guide for Practitioners. Cham: Springer International Publishing; 2024. p. 99–115.
24. Meredith SJ, Cox N, Ibrahim K, Higson J, McNiff J, Mitchell, et al. 979 Factors that influence older adults' participation in physical activity: a systematic review of qualitative studies. Age and ageing. 2022;51(Supplement_2).
25. Klicnik I, Andrawes RR, Bell L, Manafo J, Meens Miller E, Sun W, et al. Insights from neighbourhood walking interviews using the Living Environments and Active Aging Framework (LEAAF) in community-dwelling older adults. Health & Place. 2024;89(103339).
26. Kikuchi H, Inoue S, Fukushima N, Takamiya T, Odagiri Y, Ohya Y, et al. Social participation among older adults not engaged in full- or part-time work is associated with more physical activity and less sedentary time. Geriatr Gerontol Int. 2017;17(11):1921–7.
27. Van Holle V, Van Cauwenberg J, De Bourdeaudhuij I, Deforche B, Van de Weghe N, Van Dyck D. Interactions between neighborhood social environment and walkability to explain Belgian older adults' physical activity and sedentary time. Int J Environ Res Public Health. 2016;13(6):569.
28. Gough C, Lewis LK, Barr C, Maeder A, George S. Community participation of community dwelling older adults: a cross-sectional study. BMC public health. 2021;21(1):612-.
29. Boulton ER, Horne M, Todd C. Multiple influences on participating in physical activity in older age: Developing a social ecological approach. Health Expect. 2018;21(1):239–48.
30. Costello E, Kafchinski M, Vrazel J, Sullivan P. Motivators, barriers, and beliefs regarding physical activity in an older adult population. J Geriatr Phys Ther. 2011;34(3):138–47.
31. World Health Organization. Global strategy and action plan on ageing and health. 2017.
32. Bell S, Menec V. "You don't want to ask for the help"The imperative of independence: is it related to social exclusion? J Appl Gerontol. 2015;34(3):NP1–21.
33. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349–57.
34. Sallis JF, Owen N, Fisher E. Ecological models of health behavior. Health behavior: Theory, research, and practice. 2015;5(43-64).
35. Lawton MP, Nahemow L. Ecology and the aging process. In: Eisdorfer C, Lawton MP, editors. The psychology of adult development and aging. Washington, DC, Washington: American Psychological Association, American Psychological Association; 1973. p. 619–74, 719 Pages.
36. Copeland JL, Zdjelar, M., Bouchard, D.R., Dogra, S., Klicnik, I., and Leadbetter, B. Stand When You Can: Feasibility of a Multilevel Sedentary Behaviour Intervention in Assisted Living. J Aging Phys Activity. Under Review
37. Greenfield EA. Using ecological frameworks to advance a field of research, practice, and policy on aging-in-place initiatives. Gerontologist. 2012;52(1):1–12.
38. Sandelowski M. Whatever happened to qualitative description? Res Nurs Health. 2000;23(4):334–40.
39. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77–101.
40. Stand When You Can [Online Toolkit]. 2022 [Available from: https://www.standwhenyoucan.ca/.
41. Voss ML, Pope JP, Larouche R, Copeland JL. Stand When You Can: development and pilot testing of an intervention to reduce sedentary time in assisted living. BMC Geriatr. 2020;20(1):277.
42. Wilkie R, Peat G, Thomas E, Hooper H, Croft PR. The Keele Assessment of Participation: a new instrument to measure participation restriction in

population studies. Combined qualitative and quantitative examination of its psychometric properties. Qual Life Res. 2005;14(8):1889–99.
43. Computing R. R: A language and environment for statistical computing. Vienna: R Core Team; 2013.
44. Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. Front Psychol. 2013;4:863.
45. Saunders B, Kitzinger J, Kitzinger C. Anonymising interview data: Challenges and compromise in practice. Qual Res. 2015;15(5):616–32.
46. Hsieh H-F, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res. 2005;15(9):1277–88.
47. Scheidt RJ, Norris-Baker C. Many meanings of community: contributions of M. Powell Lawton. J Housing Elderly. 2003;17(1–2):55–66.
48. Brady S, D'Ambrosio LA, Felts A, Rula EY, Kell KP, Coughlin JF. Reducing isolation and loneliness through membership in a fitness program for older adults: implications for health. J Appl Gerontol. 2020;39(3):301–10.
49. Bennett EV, Hurd Clarke L, Wolf SA, Dunlop WL, Harden SM, Liu Y, et al. Older adults' experiences of group-based physical activity: A qualitative study from the 'GOAL' randomized controlled trial. Psychol Sport Exerc. 2018;39:184–92.
50. Kotlarczyk MP, Hergenroeder AL, Gibbs BB, Cameron FdA, Hamm ME, Brach JS. Personal and environmental contributors to sedentary behavior of older adults in independent and assisted living facilities. Int J Environ Res Public Health. 2020;17(17):6415.
51. Blackburn NE, Skjodt M, Tully MA, Mc Mullan I, Giné-Garriga M, Caserotti P, et al. Older adults' experiences of a physical activity and sedentary behaviour intervention: a nested qualitative study in the sitless multi-country randomised clinical trial. Int J Environ Res Public Health. 2021;18(9):4730.
52. Franke T, Sims-Gould J, Nettlefold L, Ottoni C, McKay HA. "It makes me feel not so alone": features of the Choose to Move physical activity intervention that reduce loneliness in older adults. BMC Public Health. 2021;21(1):312-.
53. Hwang J, Wang L, Siever J, Medico TD, Jones CA. Loneliness and social isolation among older adults in a community exercise program: a qualitative study. Aging Ment Health. 2019;23(6):736–42.
54. Wilkie R, Peat G, Thomas E, Croft P. The prevalence of person-perceived participation restriction in community-dwelling older adults. Qual Life Res. 2006;15:1471–9.
55. Corbett DB, Rejeski WJ, Tudor-Locke C, Glynn NW, Kritchevsky SB, McDermott MM, et al. Social participation modifies the effect of a structured physical activity program on major mobility disability among older adults: Results from the LIFE study. J Gerontol Ser B. 2018;73(8):1501–13.
56. Polenick CA, Flora SR. Increasing social activity attendance in assisted living residents using personalized prompts and positive social attention. J Appl Gerontol. 2013;32(5):515–39.
57. Statistics Canada. Living arrangements of seniors 2011 [Available from: https://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-312-x/98-312-x2011003_4-eng.cfm.

Publisher's Note