Choose to Move: A Health Promoting Physical Activity Intervention Can Also Enhance Social Connectedness

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Abstract

Background: Despite the well-known health benefits of physical activity (PA), older adults are the least active citizens. Older adults are also at risk for loneliness. Given that lonely individuals are at risk for accelerated loss of physical functioning and health with age, PA interventions that aim to enhance social connectedness may decrease loneliness and increase long-term PA participation. The objectives of this mixed-method study are to: (1) evaluate whether an evidence-based PA intervention (Choose to Move; CTM) influenced PA and social connectedness differently among self-identified 'lonely' versus 'not lonely' older adults and (2) describe features of CTM that promote social connectedness.

Methods: Two community delivery partner organizations delivered 56 CTM programs in 26 urban locations across British Columbia. We collected survey data from participants (n=458 at baseline) at 0 (baseline), 3 (mid-intervention) and 6 (post-intervention) months. We conducted in depth interviews with a subset of older adults at baseline (n=43), mid-intervention (n=38) and post-intervention (n=19).

Results: PA increased from baseline to 3 months in lonely and not lonely participants. PA decreased from 3-6 months in lonely participants; however, PA at 6 months remained above baseline levels in both groups. Loneliness decreased from baseline to 3 and 6 months in participants identifying as lonely at baseline. Features of CTM that influence social connectedness include: *Activity coach characteristics/personality traits and approaches; opportunity to share information and experiences and learn from others; engagement with others who share similar/familiar experiences; increased opportunity for meaningful interaction;* and *accountability.*

Conclusion: PA interventions that focus on social connectedness, through group-based activities can improve the health of older adults by addressing both loneliness and PA. Building social connectedness within a PA intervention for older adults may support long term changes in PA behaviours.

Background

In the next decade, we will experience an unprecedented escalation in the number of older adults in most developed countries worldwide—with an anticipated rise in loneliness (1). Interventions designed to increase long-term physical activity (PA) participation and social connectedness (2) may effectively diminish loneliness. Clearly differentiating among different concepts such as loneliness/social connectedness and isolation/social contact in older adults seems important. However, these intervention outcomes are commonly measured and analyzed together (3).

Social connectedness and loneliness are positioned at opposite ends of a continuum. *Social connectedness* is defined as 'feelings of interpersonal connection and meaningful, close, and constructive relationships with others (i.e., individuals, groups, and society). A socially connected person feels that they; (1) care about others and are cared about by others, and (2) belong to a group or community (3). Caring and respect in social relationships prompts a sense of well-being—together they act as a buffer against health problems (4) and catalyze myriad health benefits. *Loneliness* is a perceived

lack in quality or quantity of one's relationships (5) and predicts various health outcomes, including; systemic inflammation, increased blood pressure, depression, weight gain, smoking alcohol/drug use, and alone time (6–10). Loneliness is also closely linked with accelerated loss of physical functioning and health with age, and an increased likelihood that an older person discontinues PA over time (11, 12). Researchers advocate for interventions that aim to enhance social connectedness and reduce loneliness in older people, so as to also mitigate an escalation of loneliness at the population level (3, 13, 14).

Social isolation is defined as a reduced social network (15, 16) It is a quantifiable measure of the number and structure of one's relationships (i.e. social, family, and friend contacts) or frequency of interaction with others (i.e. social contact). *Social contact* is described as physical closeness, interaction (face-to-face/ in-person, internet-based, and/or telephone) or touch encounters (17), with others (18, 19). Social isolation/social contact are objective constructs whereas social connectedness/loneliness are subjective. To illustrate, an older person may be alone (i.e., isolated) but still feel a sense of social connectedness. Conversely, they may be surrounded by people (i.e., have social contact) but still feel lonely (20, 21).

In systematic reviews, interventions that aim to positively promote social connectedness and reduce feelings of loneliness among older adults are often grouped with interventions that target social contact/isolation (related but distinct concepts) (22–25). Differentiating the distinct effect of an intervention on loneliness/social connectedness versus social contact/isolation has for the most part been overlooked.

Mechanisms describe elements of an intervention hypothesized to affect a targeted behaviour [e.g., physical inactivity]. Mechanisms that drive change in loneliness/social connectedness differ from those that affect change in isolation/social contact. Although social isolation/contact may influence social connectedness/loneliness (26), they are not necessary mediators. Differentiating among these concepts is essential as core elements of interventions may target loneliness/social connectedness in important ways that differ from core elements designed to target social isolation and social contact (27). Interventions that aim to promote social connectedness in older adults, must clearly distinguish between the effect of intervention elements on social contact versus social connectedness, and the potential moderating relationship between these constructs.

Context

In partnership with British Columbia (BC) Ministry of Health, we co-created a community-based, flexible, scalable health promoting PA intervention called Choose to Move (28). In collaboration with key community stakeholders we scaled up CTM across the province of BC, Canada in three phases [2016–2020]. In Phases 1 and 2 (Jan 2016-May 2017) CTM effectively enhanced PA, mobility, social isolation and diminished feelings of loneliness in older adults (29). Our implementation evaluation demonstrated that CTM could be effectively adapted to context (30) and implemented at scale by trained activity coaches in collaboration with key community recreations organizations with established reach to older adults (29, 30).

Methods

Aims and objectives

The aim of our mixed-method study is to evaluate whether older adult's perceptions of loneliness modify the effect of CTM on PA and social connectedness outcomes.

Our specific objectives are twofold; (1) to evaluate whether CTM influenced PA differently among older adults who identified as lonely versus older adults who identified as not lonely; (2) to describe features of CTM components most likely to promote social connectedness.

Choose to Move

Elsewhere we described the CTM intervention, implementation and evaluation frameworks that guide our work (28,29,31), the benefits of CTM on PA and social connectedness (29) and factors that influenced implementation (30). Briefly, CTM is a 6-month, choice-based health promoting PA program that supports low active older adults to become more physically active and socially connected. In Phase 3, delivery components of CTM were: (1) a one-on-one consultation, and (2) regular phone call 'check-ins'-with an activity coach, (3) regular motivational group meetings (groups) with other CTM participants (up to 12 participants/group), led by an activity coach. Activity coaches received [online] standardized CTM training. Delivery 'dose' of program components was greater in the first three months (*active phase:* one-on-one, seven phone calls, four group meetings) and tapered off in the last three months (*taper phase:* three phone calls; Figure 1).

During the one-on-one consultation participants set personal PA goals, created an action plan, problem solved barriers to participation, received social support and were provided PA and health-related information. The personalized action plan was aligned with each participants' interests, abilities, income, and available resources. Activity coaches facilitated groups (4 x 1 hour each) on a monthly basis. During the group meeting, the activity coach presented information designed to promote PA and provided an opportunity to develop relationships (e.g., support, companionship) among group members. Participants were given the opportunity to participate in group or paired discussions, shared their experiences and connected with others. Individual phone check-ins provided opportunities for activity coaches to discuss progress and setbacks and to adjust their action plans accordingly.

Study design and setting

We describe our study design and implementation approach in detail elsewhere (28–31). Briefly, we conducted a type 2 hybrid effectiveness-implementation study (32). We measured participants at 0 (baseline), 3 (mid-intervention) and 6 (post-intervention) months (Figure 1). In phases 1 and 2 (Jan 2016-May 2017), two partner organizations delivered 56 CTM programs in 26 small (population 1000-29,999; n=8 community sites), medium (population 30,000-99,999; n=7 community sites) and large (population 100,000+; n=11 community sites) urban communities (Statistics Canada, 2017).

Participants

Of 534 CTM participants who enrolled in CTM, 458 (86%) consented to participate in the evaluation. Eligibility criteria were; aged ≥ 60, English speaking, and low physically active (self-reported < 150 min/week of PA), no contraindications to PA participation (Physical Activity Readiness-Questionnaire+ (33) or physician clearance). Recruitment strategies included local promotions (e.g., program guides, posters, and information sessions), media advertisements (e.g., newspaper, radio, and social media) and word of mouth.

Measurements

Quantitative

We collected survey-based data from all participants. Participants completed questionnaires at Motivational Group Meetings (0, 3 months) or at home (6 months, returned via mail). Participants who missed a group meeting were mailed a survey package (returned via mail).

Demographic characteristics

All participants completed a demographic survey at baseline that provided age category (60–74, ≥75 years), sex (male, female), self-reported height and weight (to calculate body mass index; kg/m^2), educational attainment (secondary school or less, at least some trade/technical school or college, at least some university), ethnicity (Asian, white, other), number of chronic diseases (0, 1, ≥2), self-rated health (very poor, poor, fair, good, excellent), self-efficacy for increasing PA and accessing recreation centre services (1 item each; not at all, slightly, moderately, quite or very confident), social support for PA received from family or friends (1 item each; yes, no, not sure) and capacity for mobility (no/any difficulty walking 400 m and/or climbing one flight of stairs (34).

Physical activity

At each measurement time point participants self-reported PA using a single item questionnaire: "In the past week, on how many days have you done a total of 30 minutes or more of physical activity, which was enough to raise your breathing rate? This may include sport, exercise, and brisk walking or cycling for recreation or to get to and from places, but should not include housework or physical activity that may be part of your job" (35).

Loneliness

We used a three item questionnaire (LQ-3) with a 3 point scale to assess loneliness (36). Questions asked were, "how much of the time do you feel: (1) you lack companionship; (2) left out; (3) isolated from others" (often (3), some of the time (2), hardly ever (1)). The overall score reflects the sum of the three items (range 3–9); higher scores indicate higher levels of loneliness. We classified participants as "lonely"

if they responded "some of the time" or "often" to any of the 3 components on the questionnaire and as "not lonely" if they responded "hardly ever (or never)" to all 3 components (37).

Social isolation

We assessed isolation using a three-item questionnaire (38) with a six point scale. The 3 items are summed to create an overall social isolation score (range 0-15); lower scores indicate greater levels of social isolation. We classified participants as "socially isolated" if they reported low levels of interpersonal interaction (once/month or less) (39). We defined that operationally as those who answered once/month or less for all 3 questions.

Analysis

We used Stata v13.1 for all quantitative analysis. We first assessed differences in socio-demographic characteristics between participants who identified as lonely versus not-lonely at baseline using Chi-squared or Fisher's exact test (categorical variables: sex, age category, ethnicity, education, chronic conditions, mobility limitations) and unpaired t-tests (continuous variables: BMI).

To assess whether PA and social connectedness differed by participants' loneliness status at baseline, we used general linear mixed effects models with time (0, 3, 6 months) as a categorical predictor (29). In model 1 we included sex and baseline loneliness (dichotomous measure; lonely vs. not lonely) as fixed effects. In model 2 we included additional covariates: age category, delivery partner, baseline mobility limitation, number of chronic conditions, education and BMI category (<30, ≥ 30 kg/m^2). In both models we added fixed effects sequentially and tested interactions with time after the addition of each fixed effect. With the exception of baseline loneliness*time, interactions were retained in the model only if the Wald test (40) was significant (p<0.05). We assessed model fit graphically using residual plots. Adjusted values were calculated at each time point using the margins command in Stata with a Bonferroni adjustment to account for multiple comparisons between and within loneliness groups.

Qualitative

Interviews

We conducted in depth semi-structured interviews by phone with a subset of older adults at baseline (n=43), 3 months (n=38) and 6 months (n=19). Participants were randomly selected from those who consented to the interview component. Interviews took approximately 15-30 minutes. If interview participants dropped out, the Research Coordinator asked why they withdrew and about barriers to participation. Questions included in the interview guide were created based on the relevant literature and expert opinion. Interview topics included feedback on the three intervention components (one-on-one consultation, motivational group meetings, check-ins); facilitators and barriers to committing and adhering to their Action Plan; continuing PA after CTM (Table 1).

Analysis

We reviewed transcripts using framework analysis; framework analysis is well suited to research that has specific questions, a pre-designed sample and a priori issues (41). Framework analysis is heavily based in, and driven by, the original accounts and observations of the people it is about. It allows within-case and between-case analysis (42). In the analysis, data are sifted, charted and sorted as per key issues and themes using five steps: 1. familiarize; 2. identify a thematic framework; 3. index; 4. chart; and 5. map and interpret (41,42). We briefly discuss each step below. We fully transcribed each interview verbatim. First, the lead author read through the transcripts to become more familiar with the interviews (familiarize). Second, we developed a preliminary thematic framework, consisting of themes and sub-themes. Third, the lead author used coded interviews based on the thematic framework, and coded full paragraphs to not lose contextual meaning. Fourth, we held a series of team meetings to discuss data and identify common themes. We adopted the constant comparison method (43) to compare and contrast themes within and across groups. This revealed similarities and differences in the data. We compared responses between participants who were lonely with participants who were not lonely. Finally, we examined similarities and differences between lonely and not lonely participants.

We used a number of strategies to reinforce the rigor of our study. They were--cross-checking full transcripts against original audio files for quality and completeness; reflexive memoing throughout data generation and data analysis processes; and "member reflections" (44). We also created an audit trail to record all key procedural and analytical decisions made throughout the study (45,46).

Results

Quantitative

Participants

Our final sample size at baseline was 452 participants [6 participants did not complete baseline surveys]. We summarize socio-demographic characteristics in Table 2. As previously reported (29), most participants identified as women (77%), lived in medium to large urban centres (77%), had at least some post-secondary education (75%), no mobility limitations (57%) and identified as white (86%). Specific to these analyses, 58% of participants identified as lonely at baseline (n=261). Those who identified as lonely were more likely to be women and reported lower self-rated health compared to same-age peers (Table 2). Less than 1% of participants (n=4) identified as socially isolated at baseline. Given the low prevalence of socially isolated participants in this group we were unable to explore the combined moderating influence of loneliness and social isolation; therefore, we focused solely on loneliness. Among participants who dropped out of CTM (n=49), withdrew from the evaluation (n=2) or missed an evaluation timepoint (n=51), the proportion who identified as lonely was similar between those who withdrew from, and those who remained in the study (58%).

Physical activity

Results were similar for minimally and fully adjusted models, thus we focus on the fully adjusted model here (Table 3). At baseline, PA levels were similar between participants who identified as lonely and not lonely (mean difference: -0.2 days/week (95% CI, -0.6, 0.3). PA increased significantly during the active intervention phase (baseline to 3 months) in both lonely and not lonely participants. PA decreased significantly from 3-6 months (in the taper phase) in lonely participants only. However, PA at 6 months remained above baseline levels in both groups.

Loneliness

Results were similar for minimally and fully adjusted models, thus we focus on the fully adjusted model here (Table 3). By definition, loneliness scores at baseline were different between participants identifying as lonely and not lonely; this between-group difference was maintained at 3 and 6 months. Loneliness decreased from 0-3 months in participants who identified as lonely at baseline; lower loneliness scores were maintained at 6 months. There was no change in loneliness from 0-3 months in the 'not lonely group. However, loneliness increased significantly in this group at 6 months.

Qualitative

We describe features within each of the three CTM intervention components that may influence social connectedness (Table 4). We use the term 'features' as this incorporates the 'core-functions/active ingredients' as well as other contextual factors that influence social connectedness. Interview participants were men (n=16) and women (n=27), aged 60-75 (n=33) or 75+ (n=10) who identified as lonely (n = 25), not lonely (n = 16) or did not respond (n = 2). We present participant responses by time point (baseline, 3 months and 6 months), and whether participants identified as lonely or not. Compared with not lonely participants, lonely participants more often discussed social connectedness when asked about features of CTM. Not lonely participants placed more emphasis on features of CTM known to influence PA (e.g., PA lectures). We focused our analysis on features of CTM that potentially influenced social connectedness (e.g., opportunity to share information).

Delivery components

One-on-One Consultation

Participants deemed the activity coach as essential to effectively deliver all three CTM components and to influence social connectedness. Participants' described distinct activity coach characteristics/personality traits and approaches that likely influenced social connectedness.

Feature:*Activity coach characteristics/personality traits and approaches* that likely influenced social connectedness included: being personable (easy to talk to), positive, offers encouragement, accommodates, accepting, observant, careful, motivates, provides accountability, and approachable.

Social connectedness indicators: feeling cared for (e.g., personable, accommodating), meaningful relationships (e.g., motivation and encouragement).

Participants enjoyed being able to connect with an activity coach during the one-on-one consultation, and work with them to design a personalized action plan. This process enacted feelings of being listened to and cared for and supported development of a meaningful relationship between participants and their activity coach. The activity coach-participant relationship spurred feelings of motivation and encouragement.

(Not lonely, baseline)

Oh, I really like it because it's designed individually for me and [name of Activity Coach] is really easy to talk to and very personable. And so, yeah, when we had our one-hour session on Thursday where we discussed and made the plan for this coming week. And so when she said would you be interested, she was full of ideas. And she was good at taking my ideas and adjusting them. It's personalized. So, yeah, which made it very manageable.

(Not lonely, mid-intervention)

Yeah, oh, so for the Choose to Move, yeah, having to be accountable, that's an important thing for me, I find that once I make the commitment and I just-- really didn't want to disappoint anyone else, as well as myself.

Motivational Group Meetings

Motivational Group Meetings were overwhelmingly considered of great value to create and sustain social connections. Participants described features within the Motivational Group Meetings that influenced social connectedness. These included: *the distinct characteristics/personality traits and approaches taken by the activity coach; opportunities to share information and experiences and learn from others; engage with others who share similar/familiar experiences; and increased opportunity for meaningful interaction.*

Feature:*Activity coach characteristics/personality traits and approaches* thought to influence social connectedness included being positive, offers encouragement, engages, accommodates, calls participants by name, accepting, observant, careful, and motivates.

Social connectedness indicators: feeling cared for (e.g., observant, engages, calls participants by name), meaningful relationship (e.g., motivates, offers encouragement)

(Lonely, mid-intervention)

Yeah, 'cause when I missed one of the classes everybody said, oh, good to see you back. But they didn't say "[name of participant]." But by the end of-- when (activity coach) said [name of participant], tell us

what you've done, by the end of the class everybody goes, see you the next month [name of participant], right.

(Lonely, post-intervention)

She [activity coach] is so positive and she's so encouraging. And she really knows her stuff. Because she really tries to engage everybody in-- she knows everybody and she knows everybody's progress and ability. She is encouraging that way 'cause she knows when someone is taking it slower 'cause-- sprained ankle or not feeling well that day. And so she does that in the CTM too where she, you know, like, caters it kind of individually and often as a group. And it's really hard to explain. But you do feel like you're getting individual attention even though you're also in a group getting to know everybody else.

Feature: *Opportunities to share information and experiences and learn from others* influenced social connectedness as it promoted interactions between participants, encouraged the exchange of phone numbers, provided personal introductions, engaged participants in paired and group discussions to share information on community resources.

Social connectedness indicators: feelings of belonging (e.g., bonding, getting to know everybody), feeling cared for (e.g., recognition), and meaningful relationships (e.g., communication and companionship, support, someone to talk to, not doing things on your own).

Participants discuss how they enjoyed activities that offered them the opportunity to share information and experiences with other group members. Being able to learn from others created a sense of bonding, belonging and being cared for, and developed meaningful relationships.

(Lonely, mid-intervention)

Well, everybody got to share what they did from the last meeting, and then-- like, every time, like, what we did and then if there were problems and what we plan to-- like, exactly what was in the email, but we said it out loud so everybody could hear. And I think everybody-- it was quite helpful, I think. When they had a solution to-- or everybody said, oh yeah, that happened to me. Or-- it was like bonding. So, it was nice, and everybody got to speak, and it was encouraged. And I don't think anybody was really quiet about it. So, I think everybody enjoyed sharing. Yeah, and it was nice to speak up and see if other people felt the same way sometimes.

(Lonely, mid-intervention)

I liked the meeting. I liked the fact that other people shared their difficulties. It makes me feel not so alone.

(Not lonely, post-intervention)

There are so many people out there in our age group that would benefit from this if they knew about it. It's-- so many of us people in, you know, in their 60s feel uncomfortable going to a gym because it's, you

know, full of 20 year olds and you feel like you don't belong. And this-- with our instructor it just made us feel like we were part of a group like everybody else. It was a good feeling.

Sharing/learning opportunities within Motivational Group Meetings were considered a more fruitful way to influence social connectedness than were 'lecture' style sessions.

(Not lonely, post-intervention)

But it might be nice to have actually had a-- even if it was just a get together with the group, just to see how everybody else did. I know that one lady was wanting-- she had joined the group with the purpose of, you know, finding someone else to exercise with. Which is a good thing too. But there wasn't a lot of social opportunity, I think, because we got information. We were given-- there was a video and there was talks and exercises and discussions about things that you did individually. But we really didn't have a lot of opportunities to sort of talk to one another. And that's [inaudible] I think everybody's fairly shy. But it may be something that they could throw in, maybe halfway and again at the end. A little social time, a tea or something. And just everybody could sort of talk about how they're doing things. 'Cause we learn from what some of the other people were doing too. So that was a good thing

Feature:_Engage with others who share similar/familiar experiences_ (e.g., goals, ailments) influenced social connectedness by promoting emotional and informational support to participants and offering space to share common characteristics or life experiences-- this fostered a sense of belonging and companionship.

Social connectedness indicators: feelings of belonging (e.g., not alone, companionship).

(Lonely, baseline)

There were other people in the class that, when we all introduced ourselves, were having the same kind of struggles I had, the same kind of goals and were people that I thought, hmm, okay. There's somebody I could probably call; see how they're doing because they're like me.

(Lonely, mid-intervention)

Well, companionship or-- communication and companionship with the other people who are attending. Yeah, these weren't people that I knew prior. It just-- I think it's just more supportive when there are other people that you're hearing are dealing with issues too that are similar, um-hum.

Feature:_Increased opportunity for meaningful interaction_ may influence social connectedness. Participants enjoyed the more frequent interactions during the active phase (first 3 months) of Choose to Move and felt the decline in motivational group meetings over the later months (taper phase) negatively influenced their sense of social connectedness.

Social connectedness indicators: feelings of belonging (e.g., bonding, getting to know everybody), and meaningful relationships (e.g., interaction and companionship, support)

(Lonely, mid-intervention)

Well, I think *name* (activity coach) did say they were continuing for three more months for checking in on us, right. And I'd assume it's through email, right, that it wasn't over. But it would have been nice, I think, to do it one last time, to end the program, just for a goodbye. I guess it's because I like the group maybe too, yeah.

(Lonely, post-intervention)

It was nicer when we met more frequently, I think. I think that was– yeah, 'cause we met– the first while we were meeting once a week, then once every two weeks and then it got to the month. I think the interaction for some people is a good thing. Through the winter that was really nice to have that group to go back to every few weeks, that other group, yeah. I think maybe a little more interaction would be good.

Check-Ins

Participants' describe distinct *Activity Coach characteristics/personality traits and approaches* that likely influenced social connectedness. Participants also spoke to how being held accountable influenced their sense of social connectedness.

Feature:*Activity coach characteristics/personality traits and approaches* may have influenced social connectedness by being personable (easy to talk to), positive, someone who offers encouragement, accommodates, is accepting, motivates, provides <u>accountability,</u> approachable, high energy, makes sure to be available, takes time, listens, and is thoughtful.

Social connectedness indicators: feeling cared for (e.g., listened too, understood) and meaningful relationships (e.g., accountability)

(Lonely, mid-intervention)

Well, I think if they were serious about trying to get more physical in their activity and– slowly and realistically and with support from the class and the instructor. And also, like, personal checks, either how would they prefer, email, face-to-face or phone call. So, I think it's a really good follow-up, because a lot of times you get lost in the programs or it doesn't seem like anybody cares, so you don't care.

(Not lonely, mid-intervention)

Especially the encouragement. I mean, that's the main thing anyway for me. 'Cause I live alone and it's easy to not do anything. So, it's very nice when someone phones you up and says, how are you doing and, you know, can I help you in any way, get some ideas together and stuff like that. So that helps a great deal

(Not lonely, mid-intervention)

The phone calls are very encouraging. So that helps a lot. Yeah, she's [activity Coach] fabulous. Really is a dear friend already so– wonderful lady, and a very good encourager

Feature:*Accountability* influenced social connectedness by providing participants a sense of responsibility to the Activity Coach and to themselves. The pre-planned check-in offered a consistent point of contact for participants that many looked forward to. Participants were accountable to the Activity Coach, which motivated and encouraged participants to engage in activity.

Social connectedness indicators: meaningful relationships (e.g., accountability)

(Lonely, mid-intervention)

I mean, she's right on top of it because she'll make– actually make an appointment for you. So that's a good thing too, right. Because like I said, because I'm so busy doing stuff, that way I already– it's sort of pre-planned. I know she's going to be phoning on that day, approximate time and all that. So, it's not like I– you know, so I already know that's going to take place, and that's great, yeah

(Lonely, post-intervention)

Well, I thought it was good. And she was excellent, and she made sure before she hung up that we had a date set and I had it written in my calendar. A date and time that she would call her next call. So, all the time when you're– if you weren't doing something, in your head you know oh, you– I've got to tell [name of Activity Coach] that I haven't been doing anything. So, it's just that little guilt trip there too, I guess

Discussion

We sought to disentangle related but distinct constructs that contribute to social and mental health of older adults – social connectedness/loneliness and social contact/isolation. To do so we specifically heeded the call to clarify features of interventions that influence social connectedness. We further extend the current literature, as we identify key indicators of social connectedness that likely moderate this influence. Finally, our findings support the need for choice-based, group-focused interventions that aim to influence PA and social connectedness for older adults in community based settings.

Developed countries have described an 'epidemic of loneliness' sweeping major cities (47). In the United Kingdom loneliness was identified as a key public health priority by appointing a 'Loneliness Minister', implementing a loneliness strategy for Scotland (48) and launching its 'Campaign to End Loneliness' (www.campaigntoendloneliness.org) which targets older adults. Given the close links with loss of physical functioning and overall health, taking action to counter loneliness is timely and important. We differentiated between lonely and not lonely participants to better understand how these feelings might affect health behaviours. It was telling that more than half (58%) of older adults in our study identified as lonely at baseline. Lonely participants placed greater emphasis on features of program delivery, such as activity coach characteristics, that likely influence their social health (social connectedness). Not lonely participants more often focussed on features that influence their physical health (PA). However,

participants universally identified features within each component of CTM that contributed to social connectedness.

Activity coach characteristics/personality traits were the nexus of CTM program effectiveness– and influenced social connectedness across all CTM components. Activity coaches were considered key to older adult participation (30) and effectiveness of CTM (phases 1 and 2) on mobility, social connectedness, loneliness and PA (29). Specific characteristics/traits that appeared to influence feeling socially connected were; being personable (easy to talk to), positive, accommodating, encouraging, accepting, observant, careful, motivating, and approachable. By identifying specific traits, we 'drill down' into meaningful aspects of how activity coaches respond to the needs and concerns of participants to generate feelings of social connectedness. For example, activity coaches called every participant by name so older adults got to know each other; they encouraged participants to share their experiences which cultivated a sense of bonding and belonging among the group. In traditional *fitness classes the fitness leader role* is more technical and prescriptive (49), whereas CTM activity coaches were less prescriptive serving more as a recreational 'champion' (50) by encouraging participants to do what they chose to do (and to stick with it). CTM activity coach training included elements of social support and building a sense of community to enhance social connections–ideas that they could embed into their delivery approach. We were unable to find previous studies that described characteristics, skillsets and approaches of activity coaches that were likely to influence participant level outcomes—specifically, social connectedness (47).

In the motivational group meetings participants described the importance of sharing information and experiences, learning from others and engaging with others who shared similar/familiar experiences. Their perceptions distinguished between a group of older adults in a room receiving a 'lecture' about aspects of health versus embedding strategies that foster interaction and communication among the group. Oral or video presentations may reduce social isolation by increasing social contact, but may not generate feelings of being cared for, belonging or the development of meaningful relationships. Social connectedness was facilitated when participants were partnered with others who shared similar experiences. In our study shared experiences cultivated feelings of belonging (e.g., not alone, companionship) – key indicators of social connectedness. Older adults may be more 'comfortable' and feel more 'supported' when exercising with others who are perceived to be similar to them (51).

In a recent systematic review (52), people described as more lonely were less physically active. We noted a significant decline in PA from month 3 to 6 of the program in the lonely group. We attribute this (from interviews) to the reduced number of motivational group meetings and one-on-one meetings with the activity coach during this 'taper' period. Lonely participants valued motivational group meetings as they also fostered social connections (e.g., feeling cared for, belonging, meaningful relationships); lonely participants expressed a desire for more motivational group meetings. At baseline more women (61%) than men (48%) identified as lonely. PA levels of women were more likely than men to be influenced by loneliness (53). This speaks to the need for gender sensitive implementation approaches; group- rather

than individual-based interventions may more effectively influence social connectedness in lonely women.

To maintain benefits for communities and populations beyond the initial stage of implementation, participation in community health promotion programs must be sustained over the long term (54, 55). 'Booster sessions' offered over the longer term that provide opportunities for groups to meet may counter the known decline in lonely participants PA and social connectedness. However, studies that formally evaluated effective ways to sustain benefits after participation in PA interventions over the longer term are scarce (56).

Check-ins were instrumental in developing meaningful relationships between older adults and their activity coach. However, given check-ins are resource intensive [activity coach made multiple attempts to connect with participants], strategies that optimize connectedness while diminishing intervention costs should be explored. Not surprisingly, motivational group meetings were the core component that influenced social connectedness. Thus, it may be prudent to adapt CTM to decrease the number of phone check ins and increase the number of motivational group meetings. Group meetings that focus on content that creates opportunity to share, learn and engage with others with familiar experiences may be the best means to enhance social connectedness within and outside the program (e.g., lunch dates, tea time).

Limitations

We acknowledge volunteer and recruitment bias as the reach of partner organizations was primarily to a white middle-class (on average) constituency. Given our relatively homogeneous sample, results cannot be generalized to older adults who are marginalized by virtue of sex, gender, geography, socio-economic status, health status and/or ethnicity (29). We randomly selected older adults to participate in interviews. However, as in our previous pre-post, hybrid effectiveness study, participants were not randomly assigned to group. In future, our findings should be replicated in a study purposely designed to evaluate the independent and combined effects of loneliness and social isolation on PA. Conversely the direct or mediating effect of PA on loneliness and social isolation warrants further attention.

Conclusions

First, strategies that counter the epidemic of loneliness that plague older adult populations in many developed countries, are long overdue. Second, health promoting interventions that were effective at small scale must be scaled up to promote physical, social and mental health at the population level. Strategies to scale-out CTM–implement, test, improve, and sustain an evidence-based intervention as it is delivered to new populations and/or through new delivery systems that differ from those in effectiveness trials'--are in order (57). Third, to honor the central tenets of equity, diversity and inclusion, health promoting programs like CTM must be adapted for older adults who are marginalized by virtue of their sex, gender, geography, socio-economic status, health status and/or ethnicity. Finally, COVID-19 has

dramatically altered how older adults engage–physical distancing may forever be a part of any recreational program. Thus, flexible interventions such as CTM that can be delivered in person or quickly adapted for virtual delivery (e.g., via Zoom) may be the way of the future. The unintended health consequences related to social isolation and loneliness emanating from public health measures (physical distancing put in place to eradicate transmission of COVID-19)–have yet to be fully realized.

Abbreviations

BC: British Columbia

COVID-19: Coronavirus disease

CTM: Choose to Move

PA: Physical activity

Declarations

approved the final manuscript. TF had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

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Tables

Table 1. Sample participant interview questions.

Baseline	3-month follow up	6-month follow up
Why did you decide to join this program?	How is this program working for you?	How did the last three months of Choose to Move go for you?
What (if anything) is appealing to you about this program?	What are your favourite parts of the program?	How did you find the telephone check-ins?

Table 2. Baseline socio-demographic characteristics in participants classified as 'lonely' vs. 'not lonely'.

Values are n (%) or mean (SD). Sample sizes vary between each variable due to missing data. *****Difference between groups

	Not lonely	Lonely	Total
Participants, n (women/men)	191 (138/53)	261 (212/49)*	452 (350/102)
% (men)	28%	19%	23%
Age category, n (%)			
60-74 years	126 (66%)	193 (74%)	319 (71%)
≥75 years	65 (34%)	68 (26%)	133 (29%)
Self-reported BMI, kg/m^2			
Men (n=102)	28.8 (4.6)	29.1 (4.3)	28.9 (4.5)
Women (n=342)	29.0 (6.5)	29.8 (7.7)	29.5 (7.2)
Ethnicity, n (%)			
White	168 (88%)	220 (84%)	388 (86%)
Asian	15 (8%)	20 (8%)	35 (8%)
Other	8 (4%)	21 (8%)	29 (6%)
Educational attainment, n (%)			
Secondary or less	58 (30%)	55 (21%)	113 (25%)
Some trade, technical school or college	63 (33%)	87 (33%)	150 (33%)
Some university	70 (37%)	119 (46%)	189 (42%)
Chronic Conditions, n (%)			
0	28 (15%)	33 (13%)	61 (14%)
1	78 (41%)	105 (40%)	183 (40%)
≥2	85 (45%)	123 (47%)	208 (46%)
Mobility limitations (walk or stair), n (%)			
Yes	82 (43%)	113 (43%)	195 (43%)
No	109 (57%)	148 (57%)	257 (57%)
Self-rated health, n (%) [a]			
Very poor, poor or fair for age	71 (37%)	133 (51%)	201 (45%)
Good or excellent for age	120 (63%)	128 (49%)*	248 (55%)
Self-efficacy for increasing PA, n (%) [a]			
Not at all, slightly or moderately confident	79 (41%)	127 (49%)	206 (46%)

		112 (59%)	134 (51%)	246 (54%)
Quite or very confident				
Self-efficacy for rec centre access, n (%) [b]				
Not at all, slightly or moderately confident		48 (31%)	79 (36%)	127 (34%)
Quite or very confident		105 (69%)	141 (64%)	246 (66%)

Table 3. Outcome measures by time point and baseline loneliness category.

	Month	Not Lonely	Lonely	p-value (not lonely) 0-3 mo. 0-6 mo.	P value (lonely) 0-3 mo. 0-6 mo.
Physical activity (# days/week > 30 min)	0	2.4 (2.1, 2.7)	2.2 (2.0, 2.4)		
	3	3.8 (3.5, 4.1)	3.7 (3.4, 3.9)	p<0.001	p <0.001
	6	3.4 (3.1, 3.7)	3.3 (3.1, 3.6)*	p <0.001	p <0.001
Loneliness	0	3.0 (2.9-3.2)**	5.7 (5.5, 5.8)		
	3	3.2 (3.0, 3.4)**	4.8 (4.6, 4.9)	p=0.2	p <0.001
	6	3.3 (3.1, 3.5)**	4.9 (4.7, 5.1)	p=0.006	p <0.001

Values are mean (95% CI).

Analysis adjusted for age category, gender, delivery organization, baseline mobility, number of chronic conditions, education and BMI category.

*Significantly different from 3 months within lonely group

**Significant between-group difference

Table 4. Social connectedness features of Choose to Move's three delivery components.

DELIVERY COMPONENTS		
	One-on-One Consultation	Motivational Group Meetings	Check-Ins
FEATURE	Activity Coach characteristics/personality traits and approaches	Activity Coach characteristics/personality traits and approaches	Activity Coach characteristics/personality traits and approaches
		Opportunities to share information and experiences and learn from others	Accountability
		Engage with others who share similar/familiar experiences	
		Increased opportunity for meaningful interaction	

Figures

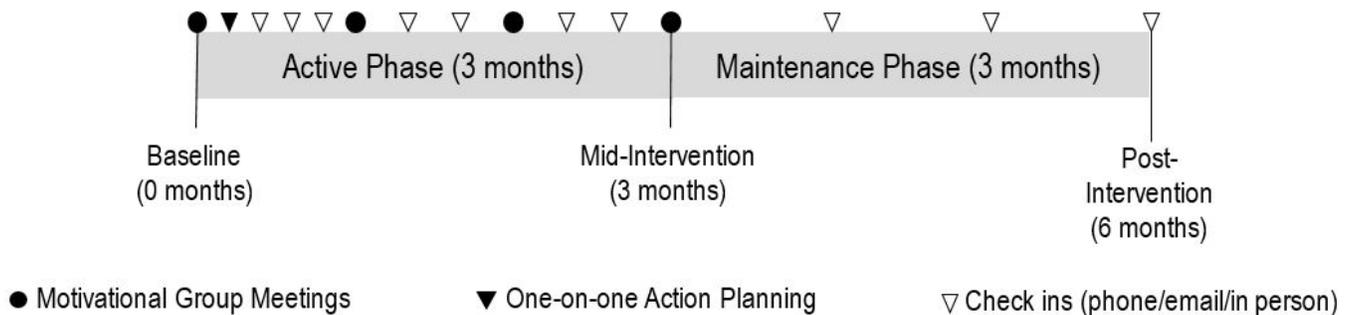● Motivational Group Meetings ▼ One-on-one Action Planning ▽ Check ins (phone/email/in person)

Figure 1

Choose to Move time points for one program. Data collection (surveys - all participants and interviews - subset) occurred at 0, 3 and 6 months. Adapted with permission from "Implementation of a co-designed physical activity program for older adults: positive impact when delivered at scale," by [blinded for review]