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Older Adults' Physical Activity and Social Participation During COVID-19

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ABSTRACT

COVID-19 disrupted older adults' physical and social participation. We examined changes in social participation and physical activity during COVID-19 and perceptions of precautionary measures and online or outdoor classes in 155 older adults (M_{age} = 70.50 ± 4.62 years). Patrons at Calgary recreation centers ≥ 65 years recruited via e-mail were surveyed between August-September 2020. Social participation (p <0.01) and resistance (p <0.01) and flexibility (p =0.03) physical activity declined. Mild physical activity increased (p =0.03). 33.57% attended online classes. Most precautionary measures were endorsed. Understanding behavior and receptivity to precautions helps providers adapt to COVID-19.

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Introduction

Engaging in physical activity and social connections as we age supports healthy and active aging (Peel, McClure, & Bartlett, 2005; WHO, 2002). However, risk for social isolation (MacCourt, 2017) and physical inactivity (Health Canada, 2002) increases with age. With the growth in the aging population, there is an increased interest in age-friendly strategies for improving health and quality of life for older adults (Government of Canada, 2017; Tate, Lah, & Cuddy, 2003; WHO, 2007). For example, the World Health Organization (WHO) published their Age-Friendly Cities Guide in 2007 and later published ten priorities on healthy aging (2017). The ten priorities included one specifically on promoting research on healthy aging by addressing current and future needs of older people (WHO, 2017). The World Health Organization's Age-Friendly Cities Guide (World Health Organization, 2007) and Active Aging Policy Framework (World Health Organization, 2002) describe healthy aging as a lifelong process, and age-friendly cities are those that promote active aging through optimizing opportunities for health, participation, and security and are inclusive of diverse needs and capacities. The Age-Friendly Cities model describes eight

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interconnecting life domains (World Health Organization, 2007). The most relevant domain to this research is social participation. Social participation refers to involvement in social activities such as recreation, and cultural, spiritual, and educational activities (World Health Organization, 2007). Social participation in turn can help prevent social isolation, which refers to low quality and quantity of social connections (MacCourt, 2017).

Group-based physical activities can simultaneously address social participation and physical activity needs, provide a meaningful social setting, and foster continued social participation among older adults. In addition, older adults who participate in group exercise classes may display greater improvements in subjective health status than those who exercise alone (Kanamori et al., 2016). However, COVID-19 has caused disruptions to physical and social participation opportunities for older adults, which may increase their vulnerability to social isolation and physical inactivity. Decreases in physical activity have been noted across adults of all ages (Gjaka et al., 2021; Yamada et al., 2020). The Canadian federal, provincial, and municipal governments implemented a range of mandatory and recommended public health measures for in-person gatherings to facilitate safety during the pandemic (Lowe, Smith, Cochrane, & Paddle, 2020). These public health measures included physical distancing, handwashing and sanitizing, cleaning, and disinfecting surfaces, ventilation for indoor spaces, and health screenings (Lowe et al., 2020). While important to limit the spread of COVID-19, these restrictions caused disruptions to habitual physical activity and social participation for all Canadians. Older adults' programs are particularly likely to be suspended or considerably reduced because older adults are at a high risk of serious negative outcomes if they contract the virus (Shahid et al., 2020). Older adults may also be especially vulnerable to social isolation and physical inactivity during COVID-19, as they may have obtained many opportunities for social interactions (Hwang, Rabheru, Peisah, Reichman, & Ikeda, 2020) and physical activity (Goethals et al., 2020; Schrack, Wanigatunga, & Juraschek, 2020) from recreational classes or community services prior to the pandemic. Similarly, older adults may be hesitant to or face pressure not to re-join or begin new physical activity classes or social opportunities due to safety concerns (Goethals et al., 2020). Furthermore, many older adults may continue to encounter barriers (e.g., lack of knowledge, cost, accessibility; Costello, Kafchinski, Vrazel, & Sullivan, 2011; Souza et al., 2020) or lack sufficient support to participate in group physical activities in the wake of COVID-19.

Effects of COVID-19 on physical activity

It has been suggested that health-related declines in older adults associated with social isolation during the pandemic could be due to disrupted opportunities for physical activity and social participation (Callow et al., 2020). Initial

studies on the effects of the pandemic on older adults have shown that physical activity is essential to protecting older adults from the physical stress of inactivity and mental duress of the pandemic because it can improve self-esteem and sense of wellbeing as well as alleviate anxiety and depression-like symptoms (Lesser & Nienhuis, 2020; Suzuki, Maeda, Hirado, Shirakawa, & Urabe, 2020). Physically active adults had better mental health scores, and participants who increased their physical activity levels or did physical activities outdoors reported lower levels of anxiety during the pandemic (Lesser & Nienhuis, 2020). Doing physical activity with other people may also be linked with maintaining or increasing physical activity levels (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003). Furthermore, social isolation may contribute to physical inactivity in older adults during the pandemic (Chaabene et al., 2021; Roschel, Artioli, & Gualano, 2020), highlighting the importance of social contact and social support in behavior change and maintenance (Lesser & Nienhuis, 2020). Unfortunately, with recreation restrictions and closures, many older adults had reduced opportunities to participate in physical activities and social interactions with others safely.

Effects of COVID-19 on social participation and social isolation

Social isolation can have adverse mental health consequences for older adults, including feelings of depression, unworthiness, alienation, or helplessness (Pancani, Marinucci, Aureli, & Riva, 2021) and lower life satisfaction (Ammar et al., 2020). Closures of recreation centers and classes, and mandatory precautionary measures created barriers for older adults' participation in group opportunities, including group physical activities, and had the potential to worsen social isolation. Physical activity often occurs in a social context, and social participation and physical activity can affect each other. Social ties can be weakened by a lack of opportunities to interact with others, such as when physical activity centers and classes closed during the pandemic (Goethals et al., 2020), and the lack of social contact can affect motivation for physical activity. Understanding how older adults' social participation and physical activity have changed is important for identifying strategies for supporting these behaviors during the pandemic and beyond.

Alternative group physical activity opportunities

Isolating at home can lead to physical inactivity; however, at-home physical activities can help older adults successfully maintain or increase physical activity levels (Chaabene et al., 2021). Many physical activity programs have adapted to COVID-19 restrictions by providing online classes such as Gerofit (Jennings et al., 2020). For example, synchronous online classes became an important resource during the pandemic because they can provide

opportunities for physical activity and social interaction in real time (Son et al., 2021). The increase in online classes may also be an important resource beyond the pandemic for increasing access to classes for those not easily reached by in-person classes for reasons such as geography, mobility, chronic illness, or preference and comfort with in-person group settings. However, there is little research on synchronous online group physical activity classes for this population.

Older adults are less likely to use the internet compared to younger age groups (Davidson & Schimmele, 2019). One Canadian poll found that 88% of adults aged 65 and older reported using the internet daily (AGE-WELL, 2020); however, data for this study was primarily collected online so results may be biased toward the more technologically inclined (AGE-WELL, 2020). In 2016, Statistics Canada found that 31.8% of older adults reported not using the internet in the past month (Davidson & Schimmele, 2019). Despite the possible lower rates of internet use among older populations, older adults aged 65 and older were the fastest-growing age group of people using the internet between 2007 and 2016 (Davidson & Schimmele, 2019). However, many older adults are still not online and may not be reached by online physical activity classes. Furthermore, online classes may not be as effective at replicating the social interactions experienced in group physical activity, which presents a potential limitation of both the reach and effectiveness of online classes.

Outdoor physical activities and classes also offer a safer alternative to indoor in-person physical activity opportunities during COVID-19 due to the decreased risk of transmission of the virus outdoors. In some cases, having classes outdoors may make it easier to enact other safety precautions such as physical distancing. Outdoor physical activity is also beneficial to mental health (Lesser & Nienhuis, 2020), as natural environments and green spaces can increase feelings of contentment and reduce feelings of depression and anxiety (Van Den Berg, Maas, Verheij, & Groenewegen, 2010). In some cases, outdoor in-person opportunities provide a welcome alternative, but weather considerations also limit them. For example, 64% of Canadians were inactive during winter months as compared to 49% in summer months, physical activity is more likely during summer as compared with winter, and seasonal physical activity differences may be due to differences in temperature and precipitation (Merchant, Dehghan, & Akhtar-Danesh, 2007).

Current study

The purpose of this study was to examine older adults' experiences of physical activity and social participation before and after the onset of the COVID-19 pandemic. We hypothesized that COVID-19 had negatively affected older adults' social participation and physical activity. Additionally, we examined

older adults' perceptions of precautionary measures that can be employed for safe in-person physical activity opportunities and barriers and facilitators for physical activity and social participation and alternative modes of delivery (e.g., online).

Methods

Procedures

This research consisted of an online self-report cross-sectional survey. Following ethical approval from the University of Calgary Conjoint Health Research Ethics Board (REB20-1226), participants were recruited via e-mail by sending a recruitment message with a link to an online survey to all 1761 patrons of City of Calgary recreation centers who were aged 65 and older. Individuals were eligible to participate if they were (1) aged 65 years or older, and (2) could complete the online survey in English. Individuals who clicked on the survey link were directed to an electronic consent form and the questionnaire. The first page of the questionnaire contained an informed consent form. If participants consented to participate in the survey, they were directed to the questionnaire. If participants did not consent, they were directed to a thank you message and were not contacted further. An e-mail reminder was sent two weeks after the initial invitation. A total of 202 people consented to participation. Two participants consented but did not answer any questions from the survey and were excluded from analysis. Additionally, participants were excluded if they did not answer at least one question regarding their behaviors and perceptions during COVID-19. Thus, the final included sample was $N = 155$. Participants could leave the survey at any time, and thus 143 (70.8%) participants fully completed the survey. The survey took approximately 20–40 minutes to complete All participants were surveyed between August and September of 2020.

Data analysis

Quantitative analyses were conducted with SPSS 26 (IBM Corp, 2019). Descriptive statistics were conducted, including means (standard deviations) and proportions (percents). Paired t-tests were conducted to examine changes in physical activity and social participation. Open-ended responses were analyzed using basic inductive descriptive qualitative analysis by grouping similar responses into common categories (Smith & Sparkes, 2016). Hierarchical content analysis methods were used to guide analysis (Smith & Sparkes, 2016). One question at a time, the first author read written responses for familiarity, then began identifying and labeling themes representing responses with similar meanings. These themes were then grouped together,

and sub-themes were identified. Lastly, the themes were reexamined by the first author and discussed with the second author to confirm they represented what was found in the original data.

Participants

This research took place in Calgary, Canada. The study included N = 155 participants who had participated in physical activity classes or used physical activity centers offered by the City of Calgary through the Calgary Recreation business unit prior to the COVID-19 pandemic. The sample was predominantly female (76.43% female, 23.57% male), ranged in age from 65 to 86 years old (M_{age} = 70.50 ± 4.62 years), predominantly identified as White (90.91%), as well as 1.52% Indigenous, 1.52% Latin American, 1.52% South Asian 0.76% African America/Black, 0.76% Chinese, 0.76% Filipino, 0.76% Japanese and 5.22% "other." The majority of participants were married or in common law relationships (55.00%), and most were retired (80.99%). Most participants had completed some form of post-secondary education (81.00%). Participants had been attending classes or using physical activity equipment at a recreation center for an average of 10.59 (±12.17) years. See Table 1 for participant characteristics.

Measures

Physical activity

A modified version of the Godin-Shephard Leisure-Time Physical Activity Questionnaire (LTPAQ; Godin & Shephard, 1985) was used to assess self-reported strenuous, moderate, mild, flexibility, and resistance physical activity both retrospectively prior to the first COVID-19 shutdown of recreation centers in the city where they study took place (March 2020, hereafter referred to as "prior to COVID-19"), and reflecting on the current time at the time of survey administration (August-September 2020, hereafter referred to as "during COVID-19"). The questionnaire was modified to ask participants to recall both the number of days in the past week that they participated in each type of physical activity (frequency), and how many minutes they spent doing that type of physical activity on average in each bout (duration). Minutes per week of each type of physical activity were calculated by multiplying the number of days by the minutes/day. Moderate-to-vigorous physical activity (MVPA) was calculated by summing the minutes per week of strenuous and moderate physical activity.

Participation in physical activity at civic recreation centers prior to COVID-19 was assessed using questions designed for this study to reflect the types of physical activities offered. Participants were asked to select all of the types of

Table 1. Participant characteristics.

	n (%)		
Gender			
Female	107 (76.43)		
Male	33 (23.57)		
Race/Ethnicity			
White	120 (90.91)		
Indigenousl	2 (1.52)		
Latin American	2 (1.52)		
African American/Black	1 (0.76)		
South Asian	2 (1.52)		
Chinese	1 (0.76)		
Filipino	1 (0.76)		
Japanese	1 (0.76)		
Other	7 (5.22)		
Working Status			
Retired	115 (80.99)		
Working/studying full-time	5 (3.52)		
Working/studying part-time	7 (4.93)		
On disability or sick leave	1 (0.70)		
Other	14 (9.86)		
Education Level			
Did not complete high school	1 (.70)		
High school diploma	8 (5.63)		
Some post-secondary, not completed	15 (10.56)		
College or technical degree/diploma	32 (22.54)		
University undergraduate degree	52 (36.62)		
Post-graduate degree	34 (23.94)		
Marital Status			
Single	18 (12.86)		
Married	67 (47.86)		
Common-law	10 (7.14)		
Separated or divorced	25 (17.85)		
Widowed	20 (14.29)		
Household annual income			
Less than $5,000	3 (2.21)		
$15,000 to $19,999	2 (1.47)		
$20,000 to $24,999	6 (4.41)		
$25,000 to $29,999	4 (2.58)		
$30,000 to $39,999	11 (8.09)		
$40,000 to $59,999	20 (14.71)		
$60,000 to $79,999	19 (13.97)		
$80,000 or over	26 (19.12)		
Prefer not to answer	45 (33.09)		
Do you have children?			
No	38 (26.76)		
Yes	104 (73.24)		
	n	*M*	*SD*
Age	139	70.50	4.619
Place of birth			
Born in Canada	104		
Born outside of Canada	39	54.15	13.24
Number of children	101	2.57	3.125
Number of people in household	140	1.72	0.710

both self-directed (e.g., weight room, lane swimming) and group classes (e.g., cardio fitness classes, dance fitness classes) they had participated in prior to COVID-19, and to indicate the number of times per week and the number of

months/years they had been participating in physical activities at civic recreation centers. Participants could also indicate any physical activities they participated in prior to COVID-19 in an open-ended question. Very few physical activities were offered in-person at civic recreation centers between March-September 2020, and offerings varied from pre-COVID-19 offerings and between centers. In addition, some outdoor and online physical activities that were not physically located at a center were offered. As such, participation in physical activity at civic recreation centers during COVID-19 was assessed using (1) an open-ended question asking participants to list any physical activities provided by civic recreation centers that they had participated in, (2) the number of times per week they typically participated, and (3) an open-ended question listing any other physical activities they had participated in during COVID-19.

Social participation

Social participation prior to and during COVID-19 was assessed using a modified version of the Social Activities Checklist (Cruice, 2012). Wording changes were made to questions to clarify meanings (e.g., fortnightly was revised to be every two weeks). This instrument lists 24 activities (including "other") and participants indicate how often they participated (not at all, rarely, monthly, every two weeks, weekly, or daily), and with whom they do the activity (by themselves, or with a spouse/partner, children, relatives, friends, and/or other people they met through the activity). Three questions were added to the original 21 to include activities at community centers, recreation centers and parks. In addition, the 'not applicable' option was removed as it was already covered under the 'not at all' option. The original SOCACT used two tables (one for how often an activity was done, and the second for who the activity was done with), but for ease of the respondents the two tables were merged. The number of activities done with other people were summed to calculate the number of social participation activities. Satisfaction with overall social participation prior to and during COVID-19 was assessed with an item from Cruice (2012) and participants indicated if they were satisfied with the social activities they do, or would like to be doing more, or fewer, activities.

Barriers to physical activities and social participation

Barriers to social participation prior to and during COVID-19 were assessed by asking participants to indicate if they faced any of the six categories of barriers: accessibility, affordability, range of activities, awareness, communication, and lack of inclusivity (World Health Organization, 2007). Participants

had the opportunity to elaborate on any barriers they endorsed in an open-ended question. This question was also modified to ask about barriers to physical activities prior to and during COVID-19.

Perspectives on physical activity during COVID-19

We developed questions asking participants about their perspectives on participating in physical activity during COVID-19 in terms of precautionary measures put in place, and via various delivery formats that recreation providers were experimenting with and/or expanding in response to COVID-19.

Participants were asked to indicate (yes/no) if they had attended an in-person exercise class at a recreation center, an outdoor physical activity class offered by a recreation center, or an online physical activity class during COVID-19. If they had, they were asked to list the opportunities and recreation centers they attended. Participants' likelihood of attending in-person physical activity classes at a center before the pandemic is over, attending an in-person class in the future (i.e., even after the pandemic is over), and participating in an online physical activity class were assessed with sliding scales from 0–100%.

To inquire about precautionary measures, participants were asked (1) an open-ended question about what precautions would need to be in place for them to return to an in-person indoor physical activity class or drop-in opportunity at a recreation center, and (2) to indicate from a list of 16 precautionary measures (reminders to distance 2 meters, markers on the floor to facilitate distancing, signs indicating safety expectation, reduced class sizes, increased time between classes to reduce crowding and allow for cleaning, recommending wearing masks during strenuous activities, recommending wearing masks during non-strenuous activities, requiring participants to wear masks, requiring staff to wear masks, required health screening questionnaires before participating, more frequent cleaning of the center, more frequent equipment cleaning, providing hand sanitizer and/or additional hand washing stations, cleaning all items participants touch after each user, improving ventilation in exercise rooms, offering outdoor activities) as well as options for "other" and an opportunity to elaborate, do not know, that no precautions will make them comfortable enough to return before the pandemic is over, and that no precautions will make them comfortable enough to return ever. To inquire further about online physical activity classes, participants were asked two open-ended questions regarding barriers to online physical activity classes and what would make it easier to participate in online classes. Participants who had attended an online class were asked open-ended questions regarding (1) what they like and (2) dislike about online classes; (3) suggestions to improve online classes; (4) whether social interaction is different in online classes as compared to in-person, and if yes, how it is better and more difficult; and (5) how social interactions in online classes may be improved.

Demographic measures

Participants indicated their age, gender, cultural/racial/ethnic group, whether they were born in Canada (and if not, how many years they had been living in Canada), highest level of education, current employment status, current marital status, whether they have children (and if yes, how many), and the number of people in their household.

Results

Preliminary analysis

Given that only a small amount of data was missing (5.65%) we did not impute missing data, and reported results based on available data for each analysis. Skew and kurtosis were determined for each continuous variable, and the data was approximately normally distributed, except for the following physical activity variables which had skewness values greater than an absolute value of 2 (Miles & Shelvin, 2001): moderate to vigorous physical activity prior to COVID-19 (skew = 2.35, SD_{skew} =0.20), moderate to vigorous physical activity during COVID-19 (skew = 3.18, SD_{skew} =0.39), resistance physical activity prior to COVID-19 (skew = 2.72, SD_{skew} =0.20), mild physical activity prior to COVID-19 (skew = 5.46, SD_{skew} =0.20), mild physical activity during COVID-19 (skew = 2.38, SD_{skew} =0.20) and flexibility physical activity during COVID-19 (skew = 2.12, SD_{skew} =0.20). Given that most values were close to 2, and it is common for physical activity variables to be somewhat positively skewed, we did not make any adjustments to these variables for the main analyses, and we proceeded using parametric statistical tests. Due to the skew of these variables, results should be interpreted with caution. Possible outliers were determined by examining the boxplot for each variable and tests were run to explore their influence. Excluding outliers did not affect the outcomes of the t-tests; thus, no outliers were removed. Descriptive statistics, including participants' reported physical activities, average weekly visits to a recreation center, social participation, barriers to social participation and physical activity, and satisfaction with physical activity and social participation levels are provided in Table 2.

Changes in perceived social participation and physical activity

Mild and moderate intensity physical activity were the most popular prior to and during the pandemic, and water-based activities were the most commonly reported self-directed and group physical activities prior to and during COVID-19. Participants reported an average of 3.12 (± 1.30) visits to a Calgary recreation site per week prior to the pandemic. During the

Table 2. Descriptive statistics prior to and during COVID-19.

	Prior to COVID −19	During COVID-19
	n (%)	*n* (%)
Self-directed physical activities		
Water-based activities (e.g., swimming)	96 (61.94)	29 (56.9)
Weights/strength training	64 (29.68)	8 (15.69)
Sports*	19 (12.58)	2 (3.92)
Running or aerobic activity	8 (5.16)	1 (1.96)
Cycling	7 (4.52)	3 (5.88)
Home workouts	6 (3.87)	1 (1.96)
Yoga or martial arts	5 (3.23)	3 (5.88)
Golf	5 (3.23)	6 (11.76)
Walking or hiking	6 (3.87)	10 (19.23)
Formal physical activity classes		
Water-based classes	88 (56.77)	2 (3.92)
Fitness classes designed for older adults	37 (23.87)	
Yoga or martial arts	36 (23.23)	1 (1.96)
Cardio	33 (21.29)	3 (5.88)
Weights/strength training	32 (20.65)	
Dance	13 (8.39)	
Online		3 (5.88)
Outdoor parks class		1 (1.96)
Satisfaction with overall social level		
Would like to do more	47 (30.32)	115 (78.77)
Satisfied	107 (69.03)	29 (19.86)
Would like to do less	1 (.65)	1 (.68)
Physical activity barriers		
Accessibility	29 (48.33)	46 (61.33)
Affordability	26 (43.33)	7 (9.33)
Range of activities	20 (33.33)	44 (58.67)
Awareness	19 (31.67)	13 (17.33)
Communication	3 (5.00)	5 (6.67)
Lack of inclusivity	8 (13.33)	9 (12.00)
Social participation barriers		
Accessibility	15 (32.61)	30 (46.15)
Affordability	25 (54.35)	8 (12.31)
Range of activities	14 (30.43)	42 (64.62)
Awareness	13 (28.26)	12 (18.46)
Communication	1 (2.17)	7 (10.77)
Lack of inclusivity	7 (15.22)	9 (13.85)
	***M* (*SD*)**	***M* (*SD*)**
Visits to recreation centers (visits/week)	3.12 (1.30)	0.91 (1.67)
Years as city recreation center patron	10.59 (12.167)	
Social participation (number of activities/week)	9.26 (4.96)	4.67 (3.18)
Physical activity (min/week)		
Moderate-to-vigorous physical activity	258.24 (223.72)	242.85 (308.75)
Mild physical activity	104.52 (172.27)	150.54 (202.04)
Resistance physical activity	47.85 (63.32)	26.42 (50.35)
Flexibility physical activity	37.82 (54.25)	28.91 (51.67)

*Sports: racquetball, basketball, pickleball, badminton, skating/shinny/hockey, skiing, curling, softball, bowling

pandemic, participants reported going to a recreation center a mean of 0.91 ±_1.67 times per week. This was a significant decrease ($t(133) = -13.34$, $p < 0.01$).

On average, resistance ($t(149) = -4.34$, $p < 0.01$) and flexibility ($t(153) = -2.24$, $p = 0.03$) physical activity declined from pre-pandemic levels; while mild physical activity increased ($t(148) = 2.25$, $p = 0.03$); and moderate-

to-vigorous physical activity (MVPA; $t(149) = -0.09$, $p = 0.42$) did not change. Participants' overall minutes per week of physical activity did not change significantly ($p = 0.95$) but included a greater proportion of mild physical activities during the pandemic.

In addition, participants' social participation significantly changed since the onset of the pandemic ($t(121) = -14.40$, $p < 0.01$). There was a significant increase in physical activities done alone ($t(94) = 2.846$, $p = 0.01$), and a decrease in those done with friends ($t(94) = -4.557$, $p < 0.01$). There was no statistical difference in activities done with a spouse ($t(94) = 0.33$, $p = 0.78$), children ($t(94) = 0.58$, $p = 0.57$), or relatives ($t(94) = -1.00$, $p = 0.32$). There was a significant difference in activities done with other people participants knew through in-person physical activities ($t(94) = -4.94$, $p < 0.01$). Participants' mean social participation score prior to COVID-19 was 9.26 ± 4.96 social activities ($n = 122$). During COVID-19, participants' social participation score was 4.67 ± 3.18 social activities ($n = 122$).

Changes in psychosocial perceptions of physical activity and social participation levels

Fewer people were satisfied with their social participation level during the pandemic ($t(145) = -10.91$, $p < 0.01$), and the number of people wanting to take part in more social opportunities increased ($t(145) = 10.52$, $p < 0.01$). Most participants (69.03%) were satisfied with their social participation level prior to COVID while 30.32% wished to be doing more. Satisfied participants shared in their open-ended responses that they were happy with the balance of social opportunities they had in their life. For those who wished to have more social opportunities, several participants expressed that they thought that they "should" be doing more but are not or would like to do more but have barriers to doing so. Barriers that prevented participants from participating in the number of social opportunities they wanted included having obligations such as being a caregiver to a family member/spouse, lack of room in drop-in classes/recreation centers, dangerous winter conditions, inability to afford fees for classes or access to recreation centers, and grief. Other reasons for dissatisfaction were a lack of motivation or energy and physical limitations and the want for specific opportunities, which for many meant options designed for older adults.

During COVID-19, satisfaction with social participation dropped to 19.86%, with the majority (78.77%) wishing to be doing more. For many, COVID-19 limited participation in social and physical opportunities through recreation closures and restrictions. Additionally, many participants were not willing to compromise their health by participating in in-person opportunities. Participants also noted in their open-ended responses the psychological

and social effects of COVID-19 and the restriction on their physical activity participation; "I'm the type who needs group activity and I really miss yoga and the weight room comradeship" (male, age 79). In other responses, some participants noted their mental health had been affected (e.g., depression, anxiety, lack of social interaction/community) by the lack of social participation (including in physical activities). The overall sentiment of participants who indicated they were satisfied with their social participation was that they felt they were doing the best they could given the circumstances; "I miss the activities that included more socializing but am willing to forego those for health and safety reasons" (female, age 67).

The top barriers to physical activities were affordability (43.33%) and accessibility (48.33%) prior to COVID-19. The top barriers to physical activity during COVID-19 were accessibility (61.33%) and range of opportunities (58.67%). See Table 2 for barriers prior to and during COVID-19. Affordability was no longer a top barrier during COVID-19, likely because most classes and recreation centers were closed or highly restricted. Participants' open-ended responses were similar between both time points, with similar themes of informational barriers, financial barriers, and location/timing barriers being noted both prior and during the pandemic. One notable exception was that the risk of contracting the COVID-19 virus was noted as a barrier during the pandemic.

The top barrier to social participation was affordability (54.35%) prior to the pandemic. The top social participation barriers during COVID-19 included accessibility (46.15%) and range of opportunities (64.62%). The top barriers to social participation were similar to the top barriers to physical activities. During the pandemic, affordability was not a top barrier, rather accessibility and range of opportunities were most frequently cited. Prior to COVID-19, participants' open-ended responses about barriers were very similar to those for physical activity. During COVID-19, open-ended responses about barriers centered mainly on health concerns related to COVID-19, including wanting to limit exposure and ceasing risky contexts. Many participants also noted that many opportunities they used to take part in are simply unavailable.

Perceptions of precautionary measures employed in physical activity contexts

Most (52.50–77.30%) participants agreed with all precautionary measures for in-person physical activity contexts except for recommending participants wear a mask during strenuous physical activity (only 30.50% agreed) and offering outdoor classes (only 45.39% agreed). Additionally, 21.99% of participants did not know what would make them comfortable, 21.28% said nothing would make them comfortable during COVID-19, and 1.46% (2 participants) said nothing would make them comfortable again. See Table 3 for the frequencies of participant agreement with each precaution. In their

Table 3. Proportion of participants who say they would feel more comfortable in in-person physical activity classes if various precautionary measures were in place.

	n (%)
Physical distancing	102 (72.34)
Floor markers	99 (70.21)
Signage	99 (70.21)
Class size	107 (75.89)
Time	101 (71.63)
Recommend mask during strenuous physical activity	43 (30.50)
Recommend mask during non-strenuous physical activity	74 (52.50)
Require mask for participants	76 (53.90)
Require mask for staff	84 (59.57)
Health screening	86 (60.99)
Clean facility more frequently	108 (76.60)
Clean equipment more frequently	109 (77.30)
Provide sanitizer/handwash stations	105 (74.47)
Clean all items after being touched	99 (70.21)
Improve ventilation	89 (63.12)
Outdoor classes	64 (45.39)
Don't know what precautions would make them feel more comfortable	31 (21.99)
No precautions would make them comfortable during COVID-19	30 (21.28)
No precautions would make them comfortable ever	2 (1.46)
Other (e.g., no vigorous physical activity indoors, frankincense, mandatory masks in the change room, vaccine, online classes)	17(12.06)

written response to a question asking what precautions they would like to see, the most common responses were physical distancing, cleaning, masks, limited numbers, and vaccinations.

Perceptions of barriers and facilitators for alternative delivery formats

During COVID-19, 20.14% of participants had attended an in-person physical activity class indoors. Participants rated their likelihood of attending an in-person class during COVID as 44.37 ± 39.73% and their likelihood of attending an in-person class in the future as 81.38 ± 30.19%. During COVID-19, 8.30% of participants had participated in an outdoor physical activity class (including outdoor pool classes, yoga, tai chi, lawn bowling, or aerobic exercise classes) at the time of the survey.

During COVID-19, only 33.57% of participants had attended an online class. The mean reported likelihood of attending online classes was 37.20 ± 37.48%. Online classes attended included yoga (n = 19) and flexibility or stretching (n = 7), "fitness" or "exercise" classes (n = 10), and cardio/aerobics (n = 7). Those who had participated in online physical activities noted that online physical activities are safe, time-efficient ways to stay active.

A common sentiment among the written responses by participants willing to try online physical activities was that while in-person classes were preferred, they would consider online classes if that was the only option. Online classes were also recognized as a potentially worthwhile option for winter when they have fewer outdoor pursuits. Other participants shared that they were interested but did not know what was available or where and how to access them. Some also expressed an interest in trying online classes if they were the ones they had participated in before closures and therefore knew the physical activity and instructor. However, many participants responded that they were not interested in online physical activities at all. Reasons for their disinterest included not being comfortable with the technology, requiring social interaction for motivation, the physical activities they previously attended do not translate online well (e.g., swimming), and not having enough space at home. Of these sentiments, the most common ones were no interest and lack of motivation or needing others to motivate them.

Barriers for online classes reported by participants in their written responses included the lack of technology or technological skill to participate; spatial and financial limitations (e.g., lack of room in the house, cannot afford the equipment); scheduling (e.g., time and day of the classes); and that the classes they took prior to COVID-19 cannot be taught online (e.g., water-based classes). Three participants noted that judging if the class is safe for older adults is hard, noting that it is difficult to understand instruction over video.

To facilitate engagement in online classes, participants shared suggestions regarding class instruction in their open-ended responses such as enthusiasm, easy-to-follow instruction and demonstrations, and classes designed specifically for older adults. Participants also responded that they would like a greater variety of classes to be available. Additionally, suggestions for class content, such as tailoring it to specific equipment/space to be more home-workout friendly was also noted. A few participants also indicated that knowing others in the class or joining classes with friends would make them more comfortable trying online classes. Most noted that online classes' lack of social interaction is something they disliked and indicated that they would like the possibility of interaction to be available to them in class. However, a few other participants noted they would prefer that social interaction be voluntary or not present at all. Participants wrote that the convenience of timing and not having to travel for class, the safety of being separated, and being able to continue classes that they were doing previously were all reasons they enjoyed online classes. Most felt that online classes are better than nothing but are not enjoyable.

Discussion

This study examined older adults' experiences of physical activity and social participation before and after the onset of the COVID-19 pandemic. Participants' experiences and perceptions of precautionary measures and alternatives to in-person group physical activities were also investigated. Our hypotheses that social participation and physical activity would change significantly during the pandemic from pre-pandemic levels were generally supported. Social participation, resistance physical activity, and flexibility physical activity all significantly declined, while mild physical activity increased and moderate to vigorous physical activity remained unchanged. Participants faced similar barriers to social participation and physical activities, including access to information. During COVID-19, fear of contracting the virus was the most prominent barrier preventing social participation and physical activity. Although online classes were not popular among participants, the majority had not tried an online class. Online classes may be a valuable opportunity, but there is a need to address technological and interest barriers.

As hypothesized, participants' social participation was negatively affected by the pandemic. This finding complements the broader literature on social participation and interactions during COVID-19, such as a global survey of over 1000 participants, which found decreased engagement in social opportunities with family and friends during the pandemic and periods when people were asked to quarantine or stay home (Ammar et al., 2020). Similarly, a rapid review from October 2020 also reported decreases in engagement in social life and fewer in-person social interactions on average after the onset of the

pandemic (Lebrasseur et al., 2021). Our study did not measure loneliness or social isolation. However, the decreases in social participation and physical activity, especially in person, and the decreased satisfaction with levels of social participation, suggest there is the possibility that loneliness and isolation may have also increased. However, our sample was predominantly married, and most lived with at least one other person and thus would have been able to continue being socially active and connected with family (e.g., a spouse) even during periods when people were asked to quarantine or stay home.

Our study found decreases in physical activity of some types and intensities; however, the overall time spent in physical activity did not decrease from pre-pandemic levels as hypothesized. The increased mild physical activity was not wholly unexpected given the physically active nature of our study's sample. This finding is similar to studies such as a North American survey where 35.7% of participants performed "about the same amount" of physical activity since the onset of the pandemic, and it was noted that while many habitual physical activities were greatly affected, light activities such as gardening or walking remained possible (Callow et al., 2020). Similarly, in a Canadian survey, 33% of physically inactive participants, and 40.3% of physically active participants increased their physical activity (Lesser & Nienhuis, 2020). Increased mild physical activity may have resulted from participants valuing physical activity and continuing to do what was possible during restrictions and periods when they were asked to stay home or quarantine (e.g., distanced walking; Richardson, Duncan, Clarke, Myers, & Tallis, 2021). Additionally, many participants in our study attended water-based physical activities prior to the pandemic, which could not be adapted to online delivery. The resulting lack of opportunities that typically provided participants with moderate to vigorous physical activity may have led to the rise of self-directed, outdoor, and often more mild intensity physical activities. The difference in the number of participants who agreed with outdoor physical activities as a precautionary measure (45.39%) and those who had participated (8.30%) may indicate that older adults are less interested in organized group physical activities but are willing to be active outdoors. As a result, more informal group activities like walking with others may be the best means of promoting outdoor physical activity participation.

Support for older adults' physical activity and social participation in the wake of COVID-19 may need to consider what barriers exist for in-person, outdoor, and online opportunities. For example, participants often stated that they did not have enough information about available opportunities both prior to and during the pandemic, and that technology-related barriers were significant at both time points (e.g., uncertainty regarding how or where to look up information). It is possible that prior to the pandemic, participants were able to rely on word-of-mouth and posters to gather and share information; however, with recreation closures, they may not know

how or be used to getting information other ways. In a report on recruitment strategies used with older adults from racial and ethnic minority populations in Detroit, community-based strategies such as information sessions and flyers were the most successful with recruitment rates of 60% and 59% as compared to other means (Ramsay et al., 2020). However, we know that internet use among older adults is growing (Davidson & Schimmele, 2019), so this is likely an evolving issue. Additionally, a dominant barrier during COVID-19 was fear of contracting the virus. Many chose not to participate in in-person opportunities for this reason, even during periods when centers were open. Such sentiments may be higher in older adults (Schrack et al., 2020). A UK study also found that compliance with public health restrictions was cross-sectionally related to levels of knowledge and information-seeking about COVID-19, indicating that the more people were concerned or learned about COVID-19, the more likely they were to avoid risky behaviors and follow restriction protocols (Wright, Steptoe, & Fancourt, 2021). Thus, considerations for advertising and safety precautions are necessary in the wake of COVID-19.

Online classes can provide older adults with physical activity and social participation opportunities and are a feasible option (Jennings et al., 2020). Being physically active with others, even online, may increase motivation or effort if classes are run synchronously. For example, a study comparing workload in synchronous versus asynchronous tele-exercise in participants with spinal cord injuries found higher average weekly and total workload in participants in the synchronous group (Costa, Dorneles, Veloso, Gonçalves, & Neto, 2021). However, online classes were not particularly popular among the participants in our study. Only about a third of participants in our study had tried an online physical activity, and many were uninterested. Our sample was quite physically active and had been involved in physical activity at recreation centers for an average of ten years. Yet, their interest in online classes was very low. It may be even harder to engage those who are less physically active. Alternatively, it may be that the sample in this study was highly dedicated to in-person physical activities that required access to recreation centers (e.g., pools) and was, therefore, less interested in alternative options.

Supporting older adults' adoption of online classes may help promote participation but can be time-consuming (Ibrahim et al., 2021). Overall, technology-related and spatial issues were a barrier to those who were somewhat interested in online activities (e.g., not having enough space at home to perform activities). Vaportzis, Giatsi Clausen, and Gow (2017) found that many older adults are open to learning how to use new technology but face a lack of support in learning and clarity in instruction and support when given. However, once they figured out the platform, they could continue with very few problems, indicating that more support is required upfront and less later

on (Ibrahim et al., 2021). The implications of this finding are that while older adults may sometimes appear hesitant to try new programs, and only a portion are interested and willing to try online classes, there is evidence that older adults can successfully join and enjoy online classes with sufficient support. It is also possible that routine and comfort contribute to why some older adults are hesitant to try new programs. Finding ways to convert familiar programs online or outdoors may help more participants feel willing to give them a try.

Limitations to this research include the cross-sectional nature of the survey and the use of retrospective recall. In addition, the sample may be biased to be more active than average older adults because they had been attending a recreation center prior to COVID-19. The sample was also primarily White. Lastly, this research was conducted early in the pandemic prior to the availability of vaccines, and as such considerations including vaccination status were not studied. Future research suggestions include examining synchronous online classes for older adults, and co-created research with older adults developing opportunities and outreach that addresses their needs. Furthermore, it may be advantageous to examine the challenges recreation providers face to providing opportunities for older adults in the wake of COVID-19 including perceptions of vaccination status. More research including the perspectives of older adults who identify as part of a racial or ethnic minority is also needed.

Conclusion

Overall, older adults' social participation and physical activity has been affected by the COVID-19 pandemic. Despite the pandemic, many older adults are interested in finding ways to stay safe while remaining physically active and engaging socially. This study has shown that many older adults are not satisfied with their current social participation. Moreover, many service providers are grappling with ways to reopen their recreation centers and classes safely. A better understanding of the impact of the COVID-19 pandemic on older adults' physical activity and social participation behaviors and perceptions is necessary for providing older adults with accessible opportunities. Working with older adults to find effective communication strategies and opportunities they would like to see is a great start. In addition, using precautionary measures for in-person opportunities and clearly identifying what precautionary measures are in place to ensure that older adults can assess the risk of attending may be important as opportunities begin in person again. Online classes are feasible, and there is some interest for them as long as social interactions and technology use are supported. Other options besides online may also be worth exploring; outdoor opportunities may only be feasible seasonally in some locations and may not appeal to all participants but are at least at times a viable alternative for some people. Promoting physical activity and finding ways for social

participation during the pandemic may be an important part of supporting older adults' health and wellbeing and thus should be addressed.

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