

Physical activity, well-being, and priorities of older women during the COVID-19 pandemic: a survey of Women's Health Initiative Strong and Healthy (*WHISH*) intervention participants

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Abstract

Sheltering-in-place, social distancing, and other strategies to minimize COVID-19 transmission may impact physical activity (PA) and well-being in older adults. To assess self-reported PA changes, well-being, and priorities of older women across the USA early in the COVID-19 pandemic. In May 2020, a 10-question survey was emailed to 5,822 women, aged over 70 years, who had been assigned to the Women's Health Initiative (WHI) Strong and Healthy (*WHISH*) trial PA intervention and had provided email addresses. The survey assessed general and physical well-being, current priorities, and PA levels before and during the COVID-19 pandemic. Demographic and physical function data were collected previously. Descriptive analyses characterized participants' priorities and PA changes from before the pandemic to the time of data collection during the pandemic. Differences in PA change by age, physical function, and geographic region were assessed by Kruskal-Wallis and post hoc Dunn tests. Among 2,876 survey respondents, 89% perceived their general well-being as good, very good, or excellent, despite 90% reporting at least moderate (to extreme) concern about the pandemic, with 18.2% reporting increased PA levels, 27.1% reporting no changes, and 54.7% reporting decreased PA levels. Top priorities "in the midst of the COVID-19 outbreak" were staying in touch with family/friends (21%) and taking care of one's body (20%). Among priorities related to physical well-being, staying active was selected most frequently (33%). Support for maintaining PA in older populations should be a priority during a pandemic and similarly disruptive events.

Keywords

Physical activity, Older women, COVID-19, Behavioral resilience

INTRODUCTION

To minimize transmission of COVID-19, many public health and behavioral strategies were implemented across the USA, including sheltering-in-place, social distancing, facility closures, and other restrictions. These measures had immediate and ongoing social, emotional, and economic ramifications affecting a host of health behaviors that may impact health outcomes. The National Institutes of Health (NIH) has called for research to evaluate the

Implications

The findings from this study, regarding priorities of older women that relate to physical activity during the COVID-19 pandemic, inform both researchers and public health professionals what key messages should be incorporated in interventions and programs targeting physical health and emotional well-being of this vulnerable population.

consequences of COVID-19 mitigation strategies, particularly among vulnerable populations [1].

Concerns that COVID-19 mitigation strategies may reduce physical activity (PA) levels [2–6] are particularly relevant to women aged 65 years and older—the most inactive segment of the US population—as fewer than 20% were engaging in sufficient PA prior to the pandemic [7]. Indeed, PA was shown to decline from pre-pandemic levels in a web-based longitudinal study of nearly 600, mostly female, respondents aged ≥ 50 (mean age 63 years) [8]. While existing research has explored both PA and well-being during the pandemic [9, 10] as well as the relationship between PA and psychological resilience [11, 12], literature exploring the behavioral resilience (i.e., the persistence of behaviors/habits in the face of an obstacle) is limited during this pandemic or in the face of other major public health disruptions.

In the midst of a pandemic, remotely delivered, population-based interventions can provide an important means for influencing PA and other health behaviors [1]. The Women's Health Initiative Strong and Healthy (*WHISH*) trial, involving 49,331 women aged over 65 years who are participating in the nationwide Women's Health Initiative Extension Study (WHI-ES) [13, 14], is investigating one such centrally delivered PA intervention. The *WHISH* trial has been delivering national PA recommendations and guidance [7, 15] to women assigned to the *WHISH* intervention, using multiple remote channels including print materials with inserts targeted at three different

physical function and activity levels, automated telephone calls, electronic mail, and a user-friendly website, since 2015. It thereby provided a unique opportunity to study how older women's PA patterns were affected early in the COVID-19 pandemic.

The present study aimed to (a) determine women's well-being 3 months into the COVID-19 pandemic; (b) determine priorities related to overall and physical well-being among older, community-dwelling women early in the COVID-19 pandemic (May and June 2020); and (c) describe self-reported changes in PA in this population by age, physical function score, and U.S. geographic region.

METHODS

Study population

The *WHISH* trial design and baseline characteristics of study participants have been published previously [13]. Briefly, 49,331 WHI-ES participants, aged 68–99 years, who were not living in a nursing home or clinical care facility and met other specific criteria were randomly assigned in 2015 to a “usual activity” comparison or an intervention designed to promote national multi-component PA recommendations for older adults [7, 15], with major cardiac events as the primary outcome [13]. Recommendations include aerobic activity (with an emphasis on walking), muscle-strengthening, flexibility and balance exercises, and reducing sedentary behavior (particularly inactive sitting). All participants were enrolled within a 6-month period in 2015. The current study involves only participants assigned to the *WHISH* PA intervention who had provided email addresses and were, therefore, receiving monthly emails in addition to the PA information delivered to all participants by mail and telephone messaging.

Survey and data collection

Participants with email addresses ($N = 5,822$; 33.4% of active *WHISH* intervention participants) were sent a digital survey by email in May 2020. Those who had not completed the survey within a week of the initial email were sent a follow-up email reminder. Surveys completed by June 2020 (1 month after the initial email) were included in this analysis. Questions for the digital survey (see [Supplementary Appendix A](#)) were developed, compiled, and adapted by the *WHISH* research team and were designed for the Research Electronic Data Capture (REDCap) platform [16] to be accessible to participants online via a unique survey link.

The first question, developed from the WELL for Life Study [17], asked about general well-being; the second assessed level of concern about the COVID-19 pandemic; the third asked participants to rank six priorities (which were based on responses to previously mailed surveys and phone/email exchanges with *WHISH* participants) at this time of the pandemic. Listed priorities included: staying

in touch with family/friends, getting medications, taking care of one's body, keeping up with finances/bills, grocery shopping/getting food, and caregiving for a family member or friend, plus a write-in option for other priorities not listed. This was followed by a fourth question that asked participants to rank four priorities specific to physical well-being (also based on prior participant input). Listed priorities included: staying active, self-care and grooming, getting enough sleep, and not sitting too much, plus a write-in option for other priorities not listed. The fifth and sixth questions asked about changes in PA levels and motivation for being physically active. The seventh question then asked whether participants had found new ways to be active during the pandemic, with an option to write in new activities. The eighth question asked about perceptions of being physically active and going outside to be active during COVID-19, and the ninth question asked about type and frequency of particular activities in or around the home before and during the COVID-19 outbreak. The final question asked what the *WHISH* team could do to provide support for participants to move more and sit less.

Participants' demographic (i.e., age, geographic location, and education) and physical function data were obtained from baseline and annual data collected as part of the WHI [18] and the *WHISH* trial [13]. The physical function scale, derived from the validated RAND SF-36 [19], uses survey items to assess limitations regarding 10 specific activities (e.g., lifting or carrying groceries, climbing one flight of stairs). Scores range from 0 to 100 (in 5-point increments for level of limitation), with physical function scores of 90 or higher describing relatively high physical function and those below 65 reflecting relatively low physical function.

Outcomes of interest

Outcomes of particular interest for the current investigation were (a) women's overall well-being 3 months into the COVID-19 pandemic; (b) daily priorities at that time of the pandemic; and (c) changes in self-reported PA from before the pandemic. An open-ended question asked women to share examples of new ways in which they were staying active, despite the disruptions in their daily lives posed by COVID-19.

Statistical analysis

Data analyses were conducted using RStudio Version 0.99.486. Descriptive analyses were conducted to summarize participants' demographic characteristics and describe their current priorities and changes in PA from before the COVID-19 pandemic. Kruskal-Wallis tests [20] identified differences in PA changes by three age groups (<77, 77–82, 83+ years), self-reported physical function score groups (<65, 65–89, 90+), WHI geographic

region (Northeast, NE; Southeast, SE; Midwest, MW; West, W), and education (less than high school, high school degree or GED, more than high school such as vocational training or associate degree, and college degree or higher). Response choices for change in PA levels were collapsed from five groups (decreased a lot, decreased a little, no change, increased a little, increased a lot) to three (decreased, stayed the same, increased) for analyses. Testing was followed by post hoc Dunn tests [21] to identify and compare specific subgroups. Differences in the frequency of specific activities were also calculated to determine how many participants increased, decreased, or maintained levels of these activities. Women who did not report activity frequencies or who did not report engaging in a given activity were excluded from these calculations. Mean frequencies (i.e., times per week) for each activity before and during the pandemic were analyzed by paired comparison *t*-tests to determine whether changes in activity frequencies were significant.

Formal qualitative analysis of write-in responses to the survey was outside the scope of this study. Write-in responses to questions three, four, and ten are not presented, but these have helped inform ongoing intervention materials. Examples of responses to question seven are presented descriptively in Table 1.

RESULTS

Response rates and characteristics of respondents

The overall survey response rate was 49.4% ($n = 2,876$). Compared to nonrespondents ($n = 2,947$), respondents were an average 1.5 years younger (81.4 vs. 82.9, $p < .001$) and had higher mean physical function scores (74.9 vs. 67.6, $p < .001$), but did not differ by race and ethnicity or WHI geographic region (see Table 2). A somewhat larger proportion of respondents than nonrespondents lived in the Western WHI-designated region (26.7%),

compared to the NE, SE, and MW regions (22.6%, $p < .001$).

Compared to the 11,930 *WHISH* PA intervention participants who did not provide email addresses, the survey group ($n = 5,822$) was slightly younger (82 vs. 84, $p < .001$) and had a higher mean physical function score (71 vs. 64, $p < .001$), and were less likely to be African American (7.8% vs. 11.9%, $p < .001$).

General well-being

The vast majority (89.3%) of respondents reported their general well-being to be good, very good, or excellent at the time of the survey. Responses to this question did not vary by age, physical function score, or U.S. geographic region (p -values $\geq .05$).

Concern about the pandemic

Nearly all participants expressed some level of concern about the COVID-19 pandemic, with 16% ($n = 458$) “extremely concerned,” 44.5% ($n = 1270$) “very concerned,” 29.2% ($n = 835$) “moderately concerned,” and 9% ($n = 258$) “a little concerned,” while only 1.2% ($n = 34$) were “not at all concerned.” Responses to this question did not vary by age or physical function score (p -values $\geq .05$) but did vary by geographic region ($H = 21.6$, $p < .001$), with NE participants expressing greater concern than participants in the SE ($p < .001$), MW ($p = .005$), and West ($p < .001$).

Priorities in the early phase of the COVID-19 pandemic (May–June 2020)

Almost all survey respondents (99.5%, $n = 2,863$) ranked at least one item as a priority during the COVID-19 pandemic (see Fig. 1). The two most frequently selected top priorities were staying in touch with family/friends (ranked as the top priority by 21% of participants and in the top three by 56%) and taking care of one’s body (ranked top by 20% and in top three by 62%). Other

Table 1 | Examples of participants’ responses to open-ended question “Have you found any new ways to be physically active during the COVID-19 outbreak? Please describe here:”

Socio-ecological framework levels	Examples of participants’ responses
Individual level	“Doing housework and laundry. I formerly hired someone to do these.”
	“Make household chores physical exercise!”
	“Doing heavier cleaning and step exercises between each project. Trying to make it more fun!”
Interpersonal level	“Virtual yoga class. Walking my dog closer to home.”
	“Zoom class live with Silver Sneakers”
	“I can get out to see others, and walk and chat with others at a distance.”
	“I’m walking and chatting with my neighbors while maintaining 6-foot social distancing.”
Environmental level	“Exercising at home instead of the gym. Climbing stairs in my condo and walking in a neighborhood park.”
	“Moved exercise bike into the family room and use while watching TV.”
	“Working in the yard, pulling weeds and planting things that grow and bloom.”

Table 2 | Demographic^a characteristics of nonrespondents, respondents, those who reported increasing/maintaining their overall PA, and those who reported decreasing their overall PA

	Nonrespondents	Respondents	p-value	Increased or maintained PA	Decreased PA	p-value ^d
Age in years (SD)	82.9 (5.6)	81.4 (4.8)	<.001	81.2 (4.8)	81.6 (4.8)	
Physical function score (SD)	67.6 (26.2)	74.9 (22.9)	<.001	77.7 (22.1)	72.5 (23.3)	<.001
Age group	N (%)					
<77	342 (11.6)	453 (15.8)	<.01	223 (16.9)	225 (14.4)	
77–82	1,157 (39.3)	1,365 (47.5)	<.01	631 (47.9)	734 (47.1)	
83+	1,447 (49.1)	1,058 (36.8)	<.01	464 (35.2)	599 (38.4)	
Physical function group						
<65	1,060 (36.0)	731 (25.4)	<.01	286 (21.7)	440 (28.2)	<.01
65–89	1,036 (35.2)	1,006 (35.0)		419 (31.8)	587 (37.7)	<.01
90+	850 (28.9)	1,139 (39.6)	<.01	613 (46.5)	531 (34.1)	<.01
Region						
Northeast	827 (28.1)	827 (28.8)		327 (24.8)	500 (32.2)	<.008
Southeast	622 (21.1)	566 (19.7)		296 (22.5)	270 (17.4)	<.008
Midwest	744 (25.3)	683 (23.7)		316 (24.0)	367 (23.6)	
West	753 (25.7)	795 (27.6)		377 (28.6)	418 (26.9)	
Education ^b						
Less than high school	28 (0.9)	18 (0.6)		13 (0.9)	5 (0.3)	
High school degree or GED	281 (9.6)	224 (7.8)		109 (8.3)	115 (7.4)	
More than high school ^c	1,020 (34.8)	816 (28.5)	<.008	384 (29.2)	432 (27.9)	
College degree or higher	1,603 (54.7)	1,803 (63.0)	<.008	807 (61.5)	996 (64.3)	

PA physical activity.

^a5 participants missing demographic data.

^b29 participants missing education data.

^cSome college, associate degree, or vocational training.

^dOnly significant *p*-values (<.05) reported.

priorities included “getting my medications” (ranked top priority by 17% and in top three by 40%), “grocery shopping/getting food” (ranked top by 14% and in top three by 45%), “keeping up with finances and bills” (ranked top by 10% of participants and in top three by 30%), and “caregiving for a family member or friend” (ranked top by 7% and in top three by 18%), while 364 participants wrote in comments to elaborate on their chosen priorities or to list a different priority.

Priorities specifically related to physical well-being

Almost all participants (99.5%, $n = 2,849$) ranked at least one priority specifically related to physical well-being during the COVID-19 pandemic (see Fig. 2). The two most frequently selected top priorities were “staying active and moving more often” (33%, $n = 942$) and “self-care and grooming (such as bathing, brushing/flossing teeth, skin care, hair care)” (31%, $n = 885$). Less frequently selected priorities were “getting enough sleep” (15%, $n = 433$) and “not sitting too much” (13%, $n = 372$), while 238 participants wrote in comments to elaborate on their chosen priorities or to list a different priority.

Change in PA in response to the early phase of the COVID-19 pandemic

Ninety-nine percent ($n = 2,848$) of respondents answered the question pertaining to changes in PA

from before the COVID-19 pandemic, with 18.2% ($n = 518$) reporting that they increased their PA levels, 27.1% ($n = 772$) reporting no changes, and 54.7% ($n = 1,558$) reporting decreasing their PA levels. Figure 3 displays PA change by age groups (a), physical function categories (b), and geographic regions (c). In comparison, in an annual mailed survey completed by *WHISH* Intervention participants in 2019, that is, before the pandemic, 20.2% ($n = 852$) of respondents to the COVID-19 survey had reported increasing their PA levels, 49.8% ($n = 2,096$) had reported no changes, and only 29.9% ($n = 1,258$) had reported decreasing their PA levels.

Responses differed by age group (Kruskal-Wallis H statistic = 8.9, $p = .01$), physical function group ($H = 76.2$, $p < .001$), and geographic region ($H = 24.5$, $p < .001$), but not by education level. A higher proportion of women in the youngest age group (<77 years) reported increasing their PA compared to the oldest age group (≥ 83 years) ($p = .01$). A higher proportion of the high physical function group (PF score ≥ 90) reported increasing their PA compared to the middle and lower physical function groups ($p < .001$). Finally, a higher proportion of SE participants reported increasing PA levels compared to NE ($p < .001$) and West ($p = .01$) participants, and a higher proportion of SE participants reported increasing PA levels compared to MW ($p = .002$) and

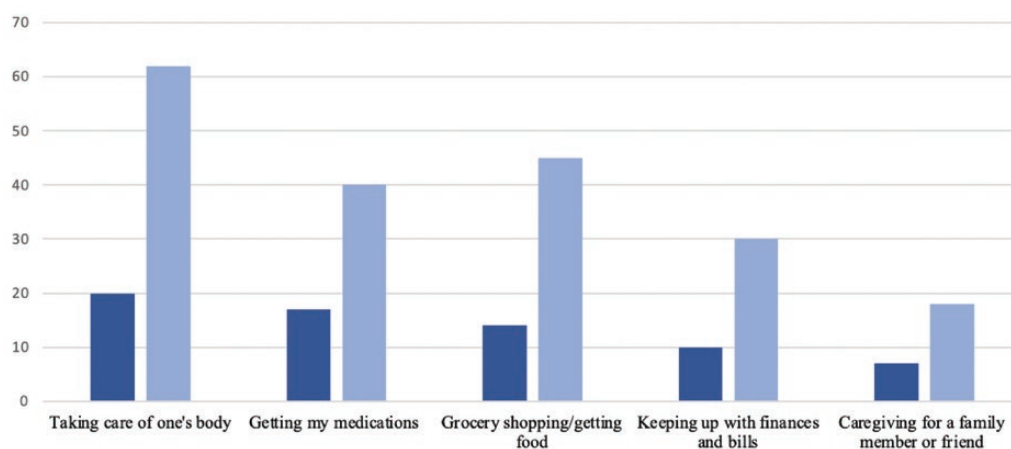


Fig 1 | Top priorities during the pandemic (May–June 2020). Dark blue displays the percent of participants who ranked the above options as their top (number one) priority. Light blue displays the percent of participants who ranked the above options as one of their top three priorities.

West ($p = .01$) participants. In contrast, self-reported changes in PA levels did not differ by geographic region in the *WHISH* 2019 survey collected before the COVID-19 pandemic. [Table 2](#) reports demographic characteristics of women who reported increasing or maintaining their overall PA compared to those who reported decreasing.

Activity-specific changes from before through the early phase of the pandemic

[Table 3](#) presents the percent of participants who reported increasing, maintaining, or decreasing the frequency of specific activities for all respondents as well as for those who reported increasing/maintaining their overall PA level and for those who reported decreasing their overall PA level. Activities are ordered by the proportion of respondents who engaged in these activities before or during the pandemic. Almost all respondents (97.4%) reported doing chores, 92.7% walked outdoors, 88.2% did home exercise, 86.6% did indoor PA (which included walking), 68.7% did yardwork or gardening, 54.9% went to a gym, 46.0% utilized online resources, and 26.6% did swimming. For each activity except attending a gym or swimming, over 70% of active women reported increasing or maintaining the frequency of the activity during the pandemic. Mean increases in frequency were significant for chores ($p < .001$), home exercise ($p < .001$), indoor PA ($p = .006$), yardwork/gardening ($p = .002$), and utilization of online PA resources ($p < .001$). Mean decreases in frequency were significant for going to the gym ($p < .001$) and swimming ($p < .001$).

Open-ended question responses

Among survey respondents, 38.1% ($n = 1,097$) provided comments detailing new ways they had found to be active during the pandemic, including strategies representing individual, interpersonal, and

environmental levels of the socio-ecological framework [22] that has been consistently related to PA behavior across the life course [23, 24]. [Table 1](#) presents selected examples of participant responses to this question.

DISCUSSION

We report here on the generally high level of overall well-being and prioritization of physical well-being, as well as self-reported changes in PA levels, reported by nearly 3,000 women aged over 70 years (mean 81 ± 4.8 years) residing across the USA in the early months (May–June 2020) of the COVID-19 pandemic. Our results indicate that the sudden major disruptions posed by the pandemic had an impact on PA, with over half reporting decreased activity levels, regardless of age, geographic region, or physical function level. A small study ($n = 165$) of PA change in community-dwelling Japanese adults (mean age 78.5 ± 8.0 years) reported comparable results, with 47.3% of participants reporting decreased activity [25]. However, 18% of the respondents to our survey actually increased and 27% maintained their pre-pandemic PA levels despite closures to gyms (used by about 56% of respondents prior to the pandemic) and public facilities such as pools (used by about 27% of respondents prior to the pandemic).

Identifying factors that influence PA in the context of the COVID-19 pandemic has been presented as an important component of a research agenda to inform COVID-19 policies and practices [5]. The fact that 45% of survey respondents increased or maintained pre-pandemic PA levels demonstrates PA-related behavioral resilience, even though the majority of women reported moderate to considerable concern about the pandemic. Moreover, a majority (62%) of survey respondents ranked “taking care of my body” as one of their top three priorities, and about one-third listed “staying active and moving

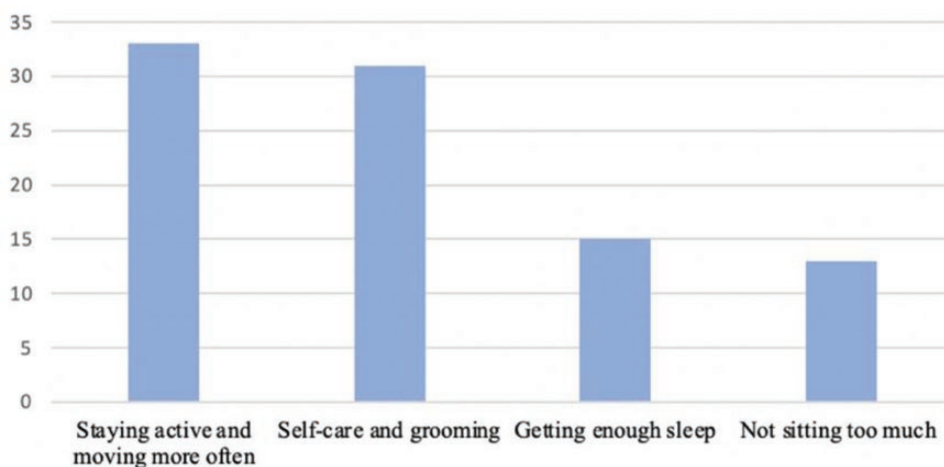


Fig 2 | Top priorities related to physical well-being. Percent of participants who ranked the above priorities (specifically related to physical well-being) as their top (number one) priority.

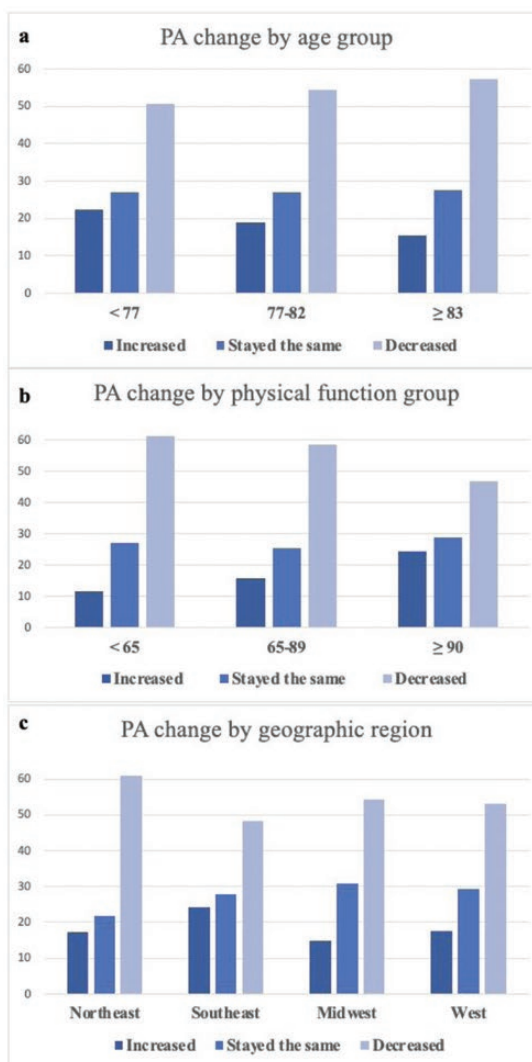


Fig 3 | Overall PA change by subgroup. (A) PA change by age group. (B) PA change by physical function group. (C) PA change by geographic region. Y-axis displays percent of participants. X-axes display age, physical function score, and geographic region, respectively.

Table 3 | Percent of respondents^a who reported increasing, maintaining, or decreasing the frequency of specific activities during the COVID-19 pandemic

	Engages in activity ^b	N (%)		
		Increased	Maintained	Decreased
Chores	2,800 (97.4)	696 (24.9)	1,815 (64.8)	289 (10.3)
Increased/maintained PA	1,281 (97.2)	308 (24.0)	856 (66.8)	117 (9.1)
Decreased PA	1,519 (97.4)	388 (25.5)	959 (63.1)	172 (11.3)
Walking outdoors	2,667 (92.7)	783 (29.4)	1,179 (44.2)	705 (26.4)
Increased/maintained PA	1,219 (92.5)	342 (28.1)	556 (45.6)	321 (26.3)
Decreased PA	1,448 (92.9)	441 (30.5)	623 (43.0)	384 (26.5)
Home exercise	2,537 (88.2)	762 (30.0)	1,425 (56.2)	350 (13.8)
Increased/maintained PA	1,166 (88.5)	345 (29.6)	650 (55.7)	171 (14.7)
Decreased PA	1,371 (88.0)	417 (30.4)	775 (56.5)	179 (13.1)
Indoor PA (e.g., walking) ^c	2,490 (86.6)	662 (26.6)	1,368 (55.6)	460 (18.5)
Increased/maintained PA	1,143 (86.7)	293 (25.6)	634 (55.5)	216 (18.9)
Decreased PA	1,347 (86.5)	369 (27.4)	734 (54.5)	244 (18.1)
Yardwork/gardening	1,976 (68.7)	592 (30.0)	380 (19.2)	1,004 (50.8)
Increased/maintained PA	947 (71.9)	301 (31.8)	103 (10.9)	543 (57.3)
Decreased PA	1,029 (66.0)	291 (28.3)	277 (26.9)	461 (44.8)
Gym	1,580 (54.9)	52 (3.3)	155 (9.8)	1,373 (86.9)
Increased/maintained PA	713 (54.1)	24 (3.4)	74 (10.4)	615 (86.3)
Decreased PA	867 (55.6)	28 (3.2)	81 (9.3)	758 (87.4)
Online resources	1,324 (46.0)	750 (56.6)	448 (33.8)	126 (9.5)
Increased/maintained PA	592 (44.9)	332 (56.1)	197 (33.3)	63 (10.6)
Decreased PA	732 (47.0)	418 (57.1)	251 (34.3)	63 (8.6)
Swim	765 (26.6)	50 (6.5)	147 (19.2)	568 (74.2)
Increased/maintained PA	348 (26.4)	27 (7.8)	74 (21.3)	247 (71.0)
Decreased PA	417 (26.8)	23 (5.5)	73 (17.5)	321 (77.0)

PA physical activity.

^aRow percents. N's used to calculate each row percent found in the "engages in activity" column.

^bN includes only those who reported engaging in each activity. Women who left an item blank or do not do the activity are not included. N's are reported for all respondents and for two subgroups: women who reported increasing or maintaining their overall PA and women who reported decreasing their overall PA. Percents are calculated from the total survey respondents or from the total respondents from each relevant subgroup (women who increased/maintained overall activity and women who decreased overall activity).

^cFor example, walking inside the house to accumulate steps.

more often" as their number one priority specifically related to physical well-being. Even amongst women who reported decreasing their overall PA, 62.9% listed "taking care of my body" as one of their top three priorities, and 30% ranked "staying active and moving more often" as their top priority related to physical well-being. Decreases in PA, therefore, did not appear to be due to a low value placed on PA or a lack of interest in these older women. The high priority placed on remaining active in the face of the pandemic is encouraging, particularly in light of studies demonstrating the importance older women and men place on maintaining mobility and preventing disability [26, 27].

We do not know whether the *WHISH* intervention materials played a role in maintaining or increasing PA in the 45% of survey respondents who reported this; nonetheless, it is reasonable to consider the potential value of remotely delivered PA interventions created for and targeted to older women, such as the *WHISH* trial, to offset the disruption in daily PA routines posed by a public health crisis, such as

the COVID-19 pandemic. Although 55% of women reported decreasing overall PA, these women did not completely give up. Regardless of reported changes in overall PA levels, a remarkable number of respondents reported increasing or maintaining their frequency of outdoor walking, home exercise, indoor PA, yardwork, or gardening, in addition to household chores—activities which *WHISH* intervention materials have previously promoted as safe and acceptable ways to maintain or increase PA and maintain or improve physical function. More than half of all survey respondents increased their use of online "exercise" resources, regardless of changes in overall PA level. This finding is consistent with a Google Trends (GT) study of nation-level online queries for the topic "exercise" (including all related search terms, such as "workouts" and "fitness training"), which reported an immediate surge in community interest in exercise within the first 2 weeks of the pandemic, followed by a decline yet a higher than before the lockdown [28]. Future interventions or public health messaging targeted

at older women may benefit from encouraging the above activities, including the use of online resources, to encourage PA in this population.

Hundreds of participants wrote in answers to the open-ended question regarding new activities and strategies they were using to stay active during the pandemic. In the face of huge life disruption, the resilience shown by these older women to find PA alternatives was impressive. For those who did not actively seek or come up with their own alternatives, appropriately targeted and delivered interventions may have helped. Of note, reports of decreases in PA were significantly higher among women in the lowest physical function group and highest age group, possibly due to greater concerns about the pandemic [29], lower ability to adapt and change PA routines, or stricter social and behavioral restrictions in place within communities aimed at these most vulnerable populations [30]. Worth noting, among this group of women aged 70 and over, we found no differences in concern about the pandemic by age.

Regional differences in reported PA changes were also observed, with a greater proportion of participants in the WHI NE region reporting decreases in their PA levels, while a smaller proportion of participants in the WHI SE reported decreases in PA levels. Regional differences in early COVID-19 prevalence, perceptions of the threat of the virus, regional weather differences, and varying levels of community restrictions likely played a role in these observed differences [31–33]. At the time the survey was sent (May–June 2020), the Northeastern part of the US was experiencing more devastating case surges and hospital shortages than other regions [34, 35]. The grim environment and tighter lockdown conditions faced by the WHI NE participants likely contributed to their more pronounced decreases in PA. Research has found that, among many factors, positive affect, social support, and even PA itself are positively linked with behavioral resilience [11, 12, 36]. Such factors are among those that have been emphasized throughout the *WHISH* intervention and should be emphasized in other interventions to promote behavioral resilience amongst older women.

This study has several limitations. Women who responded to the survey had higher physical function scores than women who did not respond. These women may have had more options for PA engagement, making it easier for them to adapt their PA routines in the face of the major COVID-19 disruption. Furthermore, given that this survey sample—restricted to women who provided email addresses—is a subset of the larger *WHISH* population, survey respondents may represent a subpopulation of older women who were more motivated to be physically active and who were more comfortable and adept at connecting to online (Internet) resources. To this point, over a quarter of all respondents reported

increasing their use of online resources for PA engagement. In addition, we do not have COVID-19 infection status data for participants. Those who were infected may have had different priorities or PA levels than those who were not. Other limitations include self-reported PA and generalizability; although the *WHISH* study design generated a population that is more likely to resemble the general population of older women in the U.S. than traditional PA interventions [13], results from this study may not be generalizable to older women not enrolled in *WHISH*. Finally, we cannot infer causation based on the cross-sectional and descriptive nature of this study.

Despite its limitations, this study has numerous strengths. Importantly, it provides information about the effects of the onset of the COVID-19 pandemic on the PA patterns of a vulnerable population, that is, women aged 70 and over (averaging 81 years), less frequently studied in the PA literature. While several studies have discussed the threat COVID-19 restrictions posed to inactivity and the importance of staying active during the pandemic [2–6, 37, 38], none, to our knowledge, have explored older women's specific PA and priorities in the face of the pandemic. Furthermore, different regions of the USA and multiple physical function categories are represented in this study sample, providing a more diverse sample with respect to these factors than is typical in the PA literature [7]. Finally, results have already been incorporated into the ongoing, adaptive intervention [13] to keep materials and messages relevant to our *WHISH* trial participants. In fact, the Summer 2020 *WHISHful* Actions newsletter presented salient results to participants, and question responses have informed motivational messaging and materials used to encourage PA, which we hope will motivate participants whose PA levels declined during sheltering-in-place to increase their overall PA to pre-pandemic levels.

CONCLUSION

While a significant proportion of older women across different regions of the USA reported decreasing their PA in the early months of the COVID-19 pandemic, nearly half maintained or even increased their levels of PA, which remained an important priority for most of these women. Many participants reported finding new strategies to be active despite the strict social and behavioral restrictions put in place to stop the spread of COVID-19. These responses signal the resilience of a significant portion of this cohort of older women in exploring ways to remain active. Remotely delivered PA interventions have a potentially valuable role to play in the maintenance of PA in vulnerable population segments, which is particularly important considering the numerous benefits to health, well-being, and daily function of regular PA, even of light intensity [39–41], can provide for older women.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Translational Behavioral Medicine* online.

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Compliance with Ethical Standards

Conflicts of Interest: All authors declare that they have no conflict of interest.

Human Rights: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

e-protocol #: 32679

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Welfare of Animals: This article does not contain any studies with animals performed by any of the authors.

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