

Research Article

Motivators and Barriers to Reducing Sedentary Behavior Among Overweight and Obese Older Adults

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Abstract

Purpose of the Study: To explore individual, social, environmental, and program-related motivators, barriers, and impacts of sedentary behavior (SB) reduction among a group of overweight and obese older adults aged 60 and older.

Design and Methods: Semistructured interviews were conducted with 24 participants following a SB reduction intervention. Transcripts from these interviews were iteratively coded by a team, and key themes were defined and refined guided by the social–ecological framework.

Results: Motivators included the desire to improve health, newly acquired awareness of SB, the ease of incorporating SB reduction into current lifestyle, an adaptable environment, and the use of reminders. Barriers included existing health conditions, enjoyment of sedentary activities, unadaptable environments, fatigue, and difficulty understanding SB reduction as distinct from physical activity (PA). Participants reported impacts on physical and mental health and changes in awareness, exercise, and daily activity.

Implications: Although in many ways motivators and barriers to reducing SB are similar to those of PA, SB interventions have special considerations and may ultimately be easier for some individuals to incorporate into their lifestyle.

Keywords: Physical activity, Qualitative, Chronic conditions

Sedentary behavior (SB)—or activities involving sitting or lying down and expending minimal energy—is highly prevalent in the United States (Matthews et al., 2008). Older adults aged 65 and older spend between 8 and 11 hr per day in sedentary time (Matthews et al., 2008). Additionally, older adults are the most overweight, with overweight and obesity at their highest among women over age 60 (Flegal, Carroll, Kit, & Ogden, 2012). Evidence suggests that prolonged periods of SB can have detrimental health effects even when regular physical activity (PA) is part of an individual's lifestyle (Dunstan, Thorp, & Healy, 2011). Therefore, reducing or breaking up long periods of

SB could be an alternative health promotion goal for older adults with overweight and obesity.

Currently there is little information about the feasibility and acceptability of SB interventions among older adults. Only one previous qualitative study examined older women's perspectives on changing SB through structured interviews. Findings suggested that pain, social pressure, and a lack of energy were barriers to SB reduction (Chastin, Fitzpatrick, Andrews, & DiCroce, 2014). Because sitting is ubiquitous, lasting throughout the day, there may be unique aspects involved in changing SB compared with PA. It is likely that strategies involving built environment

changes or prompts are key (Otten, Jone, Littenberg, & Harvey-Berino, 2009). Indeed, much of the current research on adult SB reduction has focused on providing sit-stand workstations or treadmill desks to reduce workplace sitting (Alkhajah et al., 2012; Cooley & Pedersen, 2013; Healy et al., 2013; Koeppe et al., 2013; Pronk, Katz, Lowry, & Payfer, 2012). However, this option may be less relevant to older adults who are retired or working part time.

It is also unclear whether SB facilitators and barriers are similar to facilitators and barriers to PA. Previous research indicates important PA motivators include: improved physical health, pain reduction, and better functioning; well-being and mental health; peer and/or provider support; supportive built environments; and attaining a sense of accomplishment (Baert, Gorus, Mets, Geerts, & Bautmans, 2011). Barriers include: health and mobility impairment, fatigue, lack of motivation, cost, and time constraints (Baert et al., 2011).

Thus, our study objective was to use data from in-depth qualitative interviews, conducted following an 8-week SB reduction intervention, to understand motivators, barriers, and impacts of SB reduction among overweight and obese older adults. Because barriers and facilitators noted in PA research has encompassed personal, social, and environmental barriers, we used the social-ecological model framework (McLeroy, Bibeau, Steckler, & Glanz, 1988) to explore motivators and barriers to SB reduction.

Methods

Study Sample

Participants were from a pilot SB intervention termed the Take Active Breaks from Sitting (TABS) Study. Human subjects' approval was obtained from the Group Health Research Institute. Group Health electronic medical records were used to identify a random recruitment frame consisting of 1,000 members between ages 60 and 85 that met the following inclusion criteria: not dwelling in a long term or skilled care facility, not wheelchair bound, no new cancer diagnosis within the past 12 months, no diagnosis of dementia or serious mental health or substance abuse disorders, and body mass index (BMI) >27 kg/m². Potential participants were mailed recruitment letters and directed to contact a study phone line if they were interested in learning more. A study research specialist completed phone eligibility screening and oral informed consent. Participants who reported sitting time ≥ 7 hr/day (confirmed with device-measured sitting time at baseline using activPAL thigh-worn inclinometers), the ability to walk at least one block, and availability were eligible. A total of 36 participants met initial eligibility criteria, consented to participate, and completed baseline measurements. Participants who remained eligible after baseline (i.e., had ≥ 7 hr/day of device-measured sitting time), who completed 8-week measurements ($N = 25$), and who were available took part in the exit interviews ($N = 24$).

Intervention

The intervention included mailed feedback charts from activPAL activity monitoring devices, which track time spent sitting, standing, and stepping. Participants were also mailed a study workbook providing educational content about sitting time and health, content to support SB change, and goal-setting worksheets. Self-monitoring logs were also provided to participants. After participants received these materials, they received five phone calls from a health coach focused on enhancing motivation, setting goals to reduce sitting time and increase breaks from sitting, problem-solving barriers, obtaining social support, and using built environment changes and/or prompts for sitting breaks.

Exit Interview Procedures

Participants completed the interview by phone approximately 1 week after their final measurement visit. The interviews lasted approximately 40 min (range 20–70 min) and followed a semistructured interview guide with open-ended questions and follow-up prompts. The interview covered the following topics: overall feedback and views about the intervention as a whole, specific feedback and views on each aspect of the intervention, and perceived impacts of the intervention. Example questions included: "What components of the program helped you the most to change your sedentary time?" and "In what ways do you feel sitting less has impacted your health?" (please see [Supplementary Appendix 1](#) for a list of interview questions). All interviews were audio recorded and transcribed. Recordings were erased after transcription accuracy was verified.

Data Analysis

Each interview transcript was independently coded by at least two members of a three-person coding team. The primary coder coded all transcripts and was the same individual who conducted the in-depth interviews (M. A. Greenwood-Hickman). Her background is in anthropology and public health, and she received qualitative methods training with supervision from investigators experienced in qualitative methods. She was assisted by two other team members. D. E. Rosenberg has a background in clinical psychology and public health, including training in qualitative methods. A. Renz has a background in communication and public health and received training from D. E. Rosenberg. Coding was performed using an inductive thematic approach (Boyatzis, 1998) from the exit interview transcripts. Initially, a common code list was established by the primary coder based on her experience conducting and reading the interview transcripts several times. We ultimately fit the themes to the levels of the social-ecological framework which holds that behavior is shaped by complex interplays between various intrapersonal, social, and environmental factors (McLeroy et al., 1988). This model was employed because it fit well with the themes that

emerged in initial rounds of coding and helped organize the large number of themes identified. The code list was iteratively refined by the coding team throughout several rounds of coding. Once a final code list was established and defined, all transcripts were coded independently for a final time (final codebook available in [Supplementary Appendix 2](#)). Analysis was assisted by Atlas.ti 7.0 software (SAGE Publications, Thousand Oaks, CA). Output for each code was reviewed to identify the key motivators, barriers, and impacts reported by the study participants. Only codes with three or more participant quotations were retained.

Results

Participants ($N = 24$) had an average age of 72 years (range 60–84) with a mean BMI of 34.4 kg/m² (range 26.9–47.1), and were more likely to be white, female, married, and have a college degree or higher education ([Table 1](#)). The motivators and barriers to reducing SB reported by the participants were organized into individual, social, program, and built environment factors according to the social–ecological model ([Table 2](#)).

Individual- and Social-Level Motivators for SB Reduction

Most participants believed reducing SB was a healthy choice and wanted to be healthier now and in the future. Participant (P) 16 stated, “I had heard about how sitting is really not

good for you and I had noticed that when I sit long periods of times, I notice bad effects.” Other participants were motivated to reduce limitations caused by their poor health, believing that their poor health makes certain activities or behavioral changes difficult but that reducing SB was a healthy step they could take. One participant reported, “I knew I needed to start moving more, without a doubt, and I – I have arthritis in my knees and my foot and my shoulders and my back, and it’s really easy to sit down and do nothing” (P21).

Table 2. Themes and Subthemes Relating to SB Reduction

Theme	Subtheme
Personal motivators	Desire to improve health
	Awareness of SB and monitoring
	Standing fits lifestyle
	Easy to make standing a habit
	Curious about their SB
	Reducing SB is a self-competition
	Notice positive impacts
	Sense of accomplishment
	Enjoy being more active during breaks
	Encouragement from others
Social motivators	Adaptable home or work environment
	Activity monitors are a reminder
Environment motivators	Feedback was interesting
	Positive experiences with health coaches
Program motivators	Goals helpful and appropriate
	Timers/alarms to remind to stand
	Self-log provides accountability
	Workbooks had useful information and ideas
	Health barriers
	Enjoy sedentary activities
	Feel active so do not see sitting as problematic
	Difficulty conceptualizing or applying SB distinct from PA
	Lack of time
	Fatigue
Personal barriers	Sitting habits hard to break
	No incentive to sit less
Social barriers	Inappropriate amount/type of social support
	Unadaptable environment
Environment barriers	No accountability for self-logs
	Difficulty with goal setting
Program barriers	Feedback hard to interpret
	Health coach calls too long
	Intervention too short
	Reminders were agitating or hard to use

Table 1. Demographic Characteristics of Participants

Trait	N = 24	
	n	(%)
	Mean	(SD; range)
Age	71.7	(6.4; 60–84)
Female	16	66.7
White	22	91.7
Hispanic	1	4.2
Black	1	4.2
Retired	16	66.7
Part-time work	4	16.7
Full-time work	4	16.7
BMI	34.4	(4.7; 26.9–47.1)
College degree or higher	17	71.8%
Married	15	62.5
Use assistive device	5	20.8
Cancer ^a	8	33.3
Type 2 diabetes	7	29.2
Hypertension	14	58.3
High cholesterol	13	54.2
Arthritis	10	41.7
Had a fall in past 6 months	9	37.5

Notes: BMI = body mass index.

^aThree breast cancer (12.5%), four prostate cancer (16.7%), one unknown (4.2%).

Note: PA = physical activity; SB = sedentary behavior.

Increased awareness of SB was another prominent motivator. Many participants expressed being previously unaware of how much they sat and discovered that becoming aware of their high sitting time motivated them to sit less. For instance, P13 explained, "It just made me more aware of what I was doing or not doing. Probably the main thing was I could sit through a movie without getting up, but now I wouldn't do that." Another participant reported, "I am much more aware is all I can say. I never really paid too much attention... And now I'm much more aware of the fact that oh, I need to get up and stand and march in place or something, even if it's just for a few minutes, where before you're blissfully unaware" (P25).

Another motivator was being able to easily grasp the concept of SB reduction and incorporate changes into their daily lifestyle. P2 said, "It wasn't a dictatorial, 'We want you to do this, this, and this.' It was thinking about my lifestyle and how I could make some changes in my lifestyle. So it was personalized to me." Others stated, "It certainly fit right into what I normally do," (P11) and "Well, I didn't find it difficult. You just have to get up and move" (P17). Some participants were able to incorporate changes into their daily routine so readily that they became habit. As P4 states, "I just mentally began to become aware of the fact that I was sitting more than I wanted to sit. And so I said, 'Oh, I'm sorry, I've got to get up!' So it kind of became more habit."

The indoor and outdoor environment was also an important motivator in the reduction of SB. Participants were more likely to report successful changes to SB if they had adaptable environments. Some participants were able to stand at their counter to read the newspaper or use a laptop or were able to raise the height of their computer workstation. For instance, P26 explained, "yesterday [I was] standing for a while at the kitchen counter reading the paper." P13 also stated, "I tried to read the paper or do other things standing at the counter." Other important elements of the built environment were explained by P11: "I know that for me personally, at work it was much easier to get into the program because I have utilities here that allow me to stand more often and I've got stairs and that kind of thing." P21 adds, "Having a two-story house helps. I probably do eight flights of stairs a minimum a day. I teach on one floor and live on the other."

Some participants treated changing SB as a game or competition. According to P8, "The idea of setting a plan or a goal is a good one, just kind of keeps it at the forefront of your memory and your thinking, sets up a competition with myself..." Other participants were motivated by seeing positive changes in their health and endurance that resulted from their behavior changes and by the sense of accomplishment they felt when they met their goals. P21 states, "The rewards – I don't know why, but they're – on a day-by-day basis they're better. And you're immediately rewarded when you stand up and you're not so stiff that you can't walk." P22 reflected on the most rewarding part of the program, explaining, "Well actually having done it. You know, I did manage to get out at five – to go to the swimming at 5:45, and I did manage to

go out and walk in the sunshine several days in the last few weeks. And I was feeling a little smug when I come back."

Enjoyment of nonsedentary activities as well as social support from friends and family were also notable motivators for participants to stand and move more. One explained, "So I enjoy walking outside. And that made me feel stronger. Yes, that made it easier to stay up more" (P9). Another stated, "Well, I had a bunch of gals up here at the park that I walk with. They all thought it was a hell of a good idea. They were real proud of me" (P17). Additionally, many participants were motivated by their curiosity about the concept of SB reduction; they wanted to find out if reducing their SB would have a noticeable impact on their health. As one participant said, "It seemed like a fairly straightforward and simple way to determine if there were some actual measurable benefits to a simple change in lifestyle function. In other words, to see if moving around more frequently or putting any reminders [to] get yourself up would make a difference" (P1).

Individual- and Social-Level Barriers to SB Reduction

One of the most frequently reported barriers was illness or chronic health conditions that made changes to SB challenging. Diagnosis of new illnesses or the plights of dealing with preexisting health conditions, including obesity, proved to be a challenge in their attempts to stand more and be more active. As P6 explained, "...My Achilles' tendon. I was incapacitated because of the great pain that I suffered from that and it was very painful to walk and so I got...to be very sedentary probably because it hurt to move." P20 said, "What I've got is not something – I'm not just lazy... I just can't get up and move. When I try to, I – I almost fall down and stuff like that. I'm getting fairly well paralyzed, I guess, you would say [due to] progressive spinal disease."

Another common barrier was enjoyment of sitting and sedentary activities. Some participants had difficulty changing their SBs because they felt these activities were an important part of their life and self-image that they did not want to change. As one participant expressed, "I like to sit around a lot...and I like to read and take naps or whatever. I'm not, I'm not that active" (P3). Others explained that, "I like to read and I like to watch television. I like to play cards—not frequently, but enough. I like to go out to lunch with people, or dinner. And all of that is sedentary" (P9), and "I'm retired, and I love to crochet, and getting up and down from crocheting all the time was kind of an inconvenience" (P19).

Indoor and outdoor built environment features were also implicated as barriers by participants. Most frequently, this barrier manifested as natural environmental factors like hilly landscapes or weather and seasonal changes limiting outdoor options and making outdoor walking and activities more challenging. For instance, P15 described, "If I walk in the neighborhood, I'd have to use hills and I'm just not willing to do that and wreck

my knees even more.” Other times, however, this barrier manifested through aspects of certain work or home environments that interfered with SB reduction. For instance, some participants wished to stand at their counter to read the newspaper or use a laptop computer but found their counter heights did not comfortably allow them to do so. Similarly, P21 explains, “I teach piano, and my piano is in a position where it’s difficult for me to stand very much and see what the kids are doing.”

A barrier for some was that they did not view themselves as problematically sedentary because they felt that they were regularly engaging in PA—participating in exercise classes multiple days per week, for example. These individuals had trouble recognizing that they still engaged in a high amount of SB that could be negatively impacting their health, making it difficult to motivate themselves to reduce SB. P5 expressed this sentiment by saying, “I’m a fairly active person, even though I guess according to the charts, I’m not. But as far as I and my friends are concerned, I’m pretty active... You have to convince me that the way I spend my life sitting and standing is unhealthy.”

Another barrier for participants was a feeling that their seated activities could not be interrupted by short breaks. For instance, P2 explains, “When I’m on the computer, I’m not doing it for recreation. I’m doing it for work, and sometimes I have to be focused on it. And I can’t take a break every half hour, or I lose my whole track of thought and the direction I’m going.” For others, time became a barrier as interpersonal issues arose which made it difficult to try to change their behavior. As P14 explained, “It just depends on when my schedule changed because during this period, you know, I was experiencing a lot of things like a death in the family, death in the church family, people in the hospital. So, there’s just different things that went on in my life that sometimes, you know, made it a challenge.” Others had periods of personal illness which impacted their ability to sit less.

For some participants social pressures to sit in certain situations were a barrier; lack of understanding from friends and family members resulted in low social support for sitting less. In some cases, too much support was given, as when others did tasks for a participant so that they did not have to get up. For instance, P17 explains, “Well, I don’t really have any chores. I got my son... He takes care of the place... He does all my work for me... So I don’t really have anything else [to do].” For others, however, it was social norms on a larger societal level, which encourage driving and sitting in most public places. This sometimes made participants feel self-conscious about taking actions to reduce SB. One participant explained, “It was uncomfortable for me at first like in a meeting or something just to stand up... so meetings were kind of the hardest or formal situations” (P25).

Lack of energy was a barrier for some participants. Some individuals who were particularly active earlier in the day—participating in an exercise class or walking a

significant amount—reported that they felt physically or mentally tired and wanted to rest without concern for getting up regularly. As P25 said, “I feel like I work hard during the day and do things and am busy for all intents and purposes and then there’s something about having your dinner and starting to relax that it’s a reward. It’s a reward to say oh, good I can finally read that book or let’s watch that DVD or – so it’s a psychic reward to say oh, good. I worked hard all day. I can sit now.”

For some participants, one of the biggest barriers to SB reduction was simply breaking their old sitting and behavior habits, which had accumulated over many years. For instance, P12 reports that, “Sometimes, when I’d remember, I was pretty good, but it’s also very easy to slip back into old patterns. I mean, in our 70s, we have pretty ingrained patterns.” An overall lack of motivation to change SB was also a major barrier. For some this was expressed more generally as not having an incentive to sit less, either because they were not seeing impacts from what they had already done or because they felt they lacked personal accountability for reducing their SB. For others, taking regular breaks from sitting felt artificial and forced, and they lacked a sense of what to do while standing. As P4 explained, “If I’m sitting watching TV... Do I have to get up all the time? And what would get me to get up?” Furthermore, P5 said, “I found it awkward, the whole business of getting up from sitting... It’s too artificial.”

Program Facilitators and Barriers

There were several components of the intervention that motivated or hindered participants in their efforts to reduce SB. Although some individuals reported that the activPAL monitor was, at times, tedious or annoying to wear, few reported any major concerns. For most participants, the most significant problem with the activPAL was its inability to track activities in the water and certain other forms of exercise. Many found the activPAL helpful in reminding them to stay active and reduce SB throughout the day. P4 explained, “I found that I was much more aware of the fact that when I was wearing it that I needed to make sure that I got up and moved it.” Another key program component was the feedback charts sent to participants with results from wearing the activPAL. Some found the chart’s format difficult to understand without the assistance of their health coach. However, most participants reported that they found the data useful in understanding their sitting patterns in order to set goals and track their progress. One participant explained, “Just that having a numerical reference point, it’s helpful. I find it helpful. It is impressive how much time you spent sitting. I don’t know about other people but it says... yeah I sit a lot. It’s useful to have a quantitative measurement of it” (P15).

Some participants noted that the health coaching phone calls were longer than necessary, but the majority of participants felt they supported their efforts to reduce SB. Most

expressed that interacting with their coach over the phone was ideal, meeting their need for one-on-one communication, which was preferred to a group setting, without the need for transportation to in-person meetings. For example P2 said, "I would say that in-person meetings would be cumbersome time-wise for me. Group meetings, I'm not in favor of because...I'm at the point where, if I get into a group dynamic where there are what I call B and M-ers, bitches and moaners, I don't even want to be there." For many, it was clear that the overall positive tone of the health coaches and the program materials was a facilitator to SB reduction in and of itself. As P2 further explains, "I thought she was very skilled at recognizing and praising what you did well and overall, they had a good positive tone, which is what is beneficial when people make change...I've had to maintain a pretty positive outlook to get through all this stuff, and I really appreciate that positive attitude in the study and in the conversations with [my coach]."

Throughout the program, participants set a series of goals for their SB reduction. Several participants reported that they found the process of goal setting to be difficult. For some, this was a lack of ideas about what their goals should be and how they might be accomplished. For others, it involved frustration with meeting some of the goals that they set. However, when appropriate goals were set, most participants felt that having goals was very helpful. Specifically, they felt the program allowed them to set goals that fit well in their individual lifestyles, helped keep the idea of sitting less in the forefront of their mind, and gave them direction in their efforts. The primary advantage of the goal-setting process was summarized well by P13: "You don't move forward and you don't see progress unless you establish some goals and try your best to meet them."

Many of the goals that participants set involved the use of prompts or reminders to help them remember to take standing breaks. Many participants found these reminders greatly facilitated their efforts to reduce SB; they reported using kitchen timers, watch alarms, phone alarms, computer alerts, and even Post-it notes. However, for some participants, reminder techniques were noted to be agitating or frustrating (such as constant alarms or computer reminders) or felt too artificial to use, making it more difficult to pursue their SB reduction goals.

Another important component of the program was the workbook provided to each participant as a program guide and suggestion manual. Most participants felt neutral toward the workbook or felt that it had been a useful tool in their SB reduction efforts, keeping them on track and providing them with practical ideas. P1 summarized his thoughts on the workbook by saying, "I think it was straightforward and told you what to do and how to do it and how to do it yourself." Participants were also asked to keep a log of their sitting and standing time throughout the day, although they were not required to be returned to the study team. Consequently, some individuals felt there was

a lack of accountability with the activity logs, making it difficult to faithfully fill them out, even when they acknowledged that the logs would likely have been useful. Other participants, however, felt that the activity logs were a great tool for tracking their own progress and keeping themselves accountable. P24 explained, "Well, I think charting myself, you know, they have those wonderful charts and I did it a couple times a week and to make sure you're actually going through with what you say you're doing."

Finally, many participants noted that this was a short-term study, suggesting that the program's timeline was too short to create or detect lasting changes to their daily SB. As P1 stated, "It's a very short-term study... It will be difficult to determine over the period that you run to see how much difference it makes." Consequently, some participants suggested that the program should be longer, giving participants more time to adopt these changes, or that there should be a second portion of the program that participants might participate in 6–12 months after this program in order to reaffirm and further develop their improved SB habits.

Program Impacts

Participants noted a number of impacts to their life as a result of their participation in the program (Table 3; see [Supplementary Appendix 3](#) for further supporting quotations). Some participants cited improvements to their overall physical health, noting that reducing their SB made it easier to move around by reducing stiffness, improving balance, and managing chronic pain from various health conditions. P1 explained, "I find it easier to get up and down and move around. I find myself not sitting so long that I end up being stiff and wobbly when I get up, because I tended to in the past...I can move around faster and go up and down stairs easier, so it's been a major factor I think." Additionally, improved sleep quality and alertness and reduced fatigue during the day were noted. P6 explained, "Like when I clean the house, I didn't get nearly as exhausted as I have in the past." For some, attempting to reduce SB led to a noticeable change in their ability to concentrate on tasks and an overall improvement to their mood throughout the day. As P16 described, "I find when I sit long periods of time, I kind of dwell on not so good things and I get kinda depressed and it's hard to get out of it, but since I've been doing this and the fitness thing, I've found that I have not been so depressed and when disappointments have come about, I find that I do not dwell on them and I am able to get out of that mood quite easily." In addition to these changes, some participants noted that they had incorporated more standing time into their routines, particularly associated with activities like watching TV and using the computer. This meant standing on commercial breaks or simply standing while watching their program, or, in the case of computer time, using a standing desk or computer station. It is important to note

Table 3. Themes and Subthemes Relating to Participant-Reported Impacts of the Intervention

Theme	Subtheme
Impacts on physical health	Easier to move around
	Reduced stiffness
	Better balance
Impacts to mood and self-perception	Improved chronic pain management
	General feelings of better health and well-being
Impacts on PA levels	Improvements to overall mood
	Increase in devoted PA time, especially daily walking
Impacts on SB awareness	Heightened awareness of SB in his/her own life
	Heightened awareness of how much SB is encouraged in society
Impacts on sleep and cognitive function	More alert throughout the day
	Less fatigue
	Improved concentration
	Better sleep quality
Impacts to general activity level	Increase in daily activity level such as household chores
Impacts to standing time	Increased standing time and standing activities
Impacts to social interaction	Changes in amount of socialization (both increase and decrease reported)

Note: PA = physical activity; SB = sedentary behavior.

that some participants did not report feeling any changes to their physical or mental health, although many of these individuals expressed an expectation that they might experience long-term health benefits from the program, despite not noticing immediate benefits.

Apart from the direct effects on the mental and physical health of some participants, many noted changes to their daily activity level and exercise habits. Specifically, many participants expressed that taking active breaks from sitting prompted them to do more chores around the house or yard and generally get more accomplished throughout the day. P14 summarized this impact by explaining, "... with that it has helped me a lot to, you know, challenge myself to, you know, get up, take a break so when the TV commercial's on, we try to do some other things and then I started finding different little projects to do in the evening so that I could break my pattern from sitting so long." In addition to this generalized increase in daily activity, some participants expressed that their endeavors to reduce SB led to more PA and exercise in their routines. For most, this meant more walking, either throughout their daily activities or additional walking for the sake of exercise. For instance, P21 described the following changes: "I've started walking on a treadmill... and I started taking an activity class, similar to the class I take in the pool, only it's not in the pool,

and some of the things are a lot harder when you're standing on a floor. So, I added those things because of that need to do things for a longer period of time." Another participant reported, "Yeah, more exercise...an extra walk during the day. I always take two walks because we have a dog... but it also makes me—I've done a third walk or jogged a little bit" (P24).

Overall, the most commonly reported impact was the acquisition of a heightened awareness of SB both personally and societally. Most participants reported feeling more aware of the amount of time they spent sitting and standing at the end of the study, expressing that they now felt more able to make conscious decisions about their SB habits. P6 explained, "I'd say the emphasis on getting around and moving more, just focusing attention on it has been very helpful, made me feel better." Similarly, P7 expressed, "Yeah, it's difficult, but I'm conscious of it. That's the good thing. Maybe over time I'll do more." Participants also noted being more aware of the societal norms encouraging people to sit. P12 expressed this awareness, saying, "I think that it would be good for [physicians] to know about this study. And I think a lot of people just don't think about the consequences of too much sitting." P25 also explained, "Well, I think things like this are helpful. The baby boomers are aging... I think awareness is – is a big part of it. I don't think we're aware or as aware as we think we are of our activity patterns." Furthermore, for some participants this increased awareness of SB prompted them to make changes in their socialization patterns, changing the amount of time and ways in which they were socializing with others.

Discussion

Overall, we found support for the feasibility and acceptability of SB reduction in older adults with many chronic conditions as well as overweight and obesity. The results of our qualitative analysis suggest that changing SB is not simple, but that participants are willing and interested in reducing SB and report health impacts from sitting less. Motivators and barriers spanned personal, social, and environmental factors. At the personal level, individual health, motivation, preferences for activity, time, and an understanding of the concept of SB served as motivators and barriers. Regarding social factors, being in a social climate that promotes sitting or around people who were not supportive of less sitting were barriers. Work that fostered a great deal of sitting, home environments that were not conducive to standing while reading or using the computer, or neighborhoods that were difficult to navigate on foot were environmental barriers. Awareness and willingness to use reminders to prompt breaks from sitting were also motivators. Most participants thought changing sedentary time would be easy, but learned over the course of the study how difficult it could be. Becoming more personally and societally aware of SBs helped participants develop new routines.

Program components were similar to those found in PA studies including enhancing motivation through motivational interviewing strategies, goal setting, problem solving, and self-monitoring. Participants were generally satisfied with these components and reported the phone-based approach worked well for their lifestyle, providing the desired one-on-one support without the need to find transportation to an in-person meeting. Participants did not have difficulty wearing the activPAL and reported that it helped motivate them to sit less. This could have affected baseline measurements (resulting in higher than normal baseline activity) and suggests the importance of including a control group in future studies.

Although the motivators and barriers to SB reduction reported here were largely similar to PA interventions, there were certain key differences. First, while some participants regarded the support of a health coach and/or family and friends to be helpful in changing SB, most viewed this type of behavior change as very personal and independently motivated. In short, direct social support appears to be helpful to SB change but less necessary than it is for PA changes. Additionally, cost is a common barrier to PA that was not mentioned as a barrier by our participants. Although increasing PA is often associated with the expense of gym membership or equipment, changing SB does not seem to elicit the same monetary concerns. In general, SB reduction was viewed as easy to fit into daily life, which may be distinct from how participants viewed fitting PA or exercise programs into their lifestyle and may make SB reduction more appealing than an exercise program. As P21 explains, "It was a matter of finding just something that could fit into my schedule, and I'm not gonna get into any program that requires a lot of time or anything like that, it has to be little bits of things that I can do here and there."

Interestingly, most participants reported that they observed health benefits from sitting less and believed they were sitting less than their baseline level. The reported health impacts of their perceived decreased sitting were similar in some ways to those reported in PA trials, such as improved mood and fatigue. However, some impacts were unique, including improved symptoms like less stiffness and better overall alertness, improved mood throughout the day, and increased engagement in household activities or chores, increasing lifestyle activity. Interestingly, some people noted an increase in exercise from sitting less but others did not. This lends further evidence to a definition of SB as involving behavior changes (e.g., sitting less partially by standing more) separate from physically active behaviors. Also, participants noted changes in activities they do around the house which would most likely be considered nonexercise, light-intensity activities. Thus, participants could sit less without appreciably altering their exercise activity. Although it is thus far unclear what the health effects may be, our participants noted many impacts on their health from sitting less.

One theme indicated that many participants felt they were already active and were unable to understand the difference between PA and sedentary time. As this intervention progressed, we refined study materials to better differentiate SB reduction from increased PA, and this theme became less common, though it did not disappear. This underscores that the distinction between SB reduction and PA can be unclear and difficult for some participants to grasp. Future SB interventions should highlight this distinction in order to overcome this barrier.

Limitations of the study included the use of a convenience sample of participants who may not be representative of the older adult population at large. However, objective and population-wide generalizable knowledge is not the main goal of qualitative research (Morse, 1999; Myers, 2000) and our sample included older adults with multiple chronic conditions who have traditionally been excluded from research studies. An additional limitation is that the intervention was relatively short term and it is possible that other motivations and barriers may arise as individuals attempt to change SB in the long term. Strengths of our study include the qualitative methodology employed which allowed us to capture patient-reported barriers, facilitators, impacts, and feedback. We believe it was a strength that we conducted interviews following the intervention so that participants could better reflect and understand what it is like to change SBs.

Overall, we found that there are many individual, social, environmental, and programmatic motivators and barriers to SB reduction in overweight and obese older adults consistent with those found previously for older women (Chastin et al., 2014). It is clear that the behavior changes associated with SB reduction can be complex and challenging for participants. Although the facilitators and barriers to SB reduction share many similarities with PA, there are unique considerations that must be made for SB reduction. Some motivators could make SB reduction a more feasible target than increasing PA, such as the finding that many participants felt SB reduction easily fit within daily habits. Social support was a less prominent theme than is often observed in PA studies. P14 explained, "More exercise is always nice but with it focusing on you just sitting and standing and then you think about all the things you can do in between, it kind of develops an exercise right along as you do that and it doesn't really interfere with your routine that much." Other barriers, such as the need to engage in less sitting throughout the day even while engaging in sedentary activities they enjoy, may make SB change more difficult for some. Overall, more research is needed to inform the best ways to reduce SB in older adults and to further elucidate whether meaningful objective health improvements occur with SB reduction.

Supplementary Material

Please visit the article online at <http://gerontologist.oxfordjournals.org/> to view supplementary material.

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