


Understanding Physical Activity Differences Among Older Adults: Validating a Proposed Typology of Physical Activity as a Tool to Increase Physical Activity by Older Adults

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Abstract

Objective: Being physically active as one ages benefits both physical and mental health and remains a public health need. A typology to understand older adults' PA level and intentions can be vital to developing strategies to promote PA.

Methods: The researchers developed a comprehensive interview guide and interviewed adults 50 years and older ($n=232$) to test the validity of the four-type typology (1). Frail, (2). Ambivalent, (3). Aspiring, (4). Active).

Results: The Kruskal–Wallis test and the Bonferonni post hoc analysis indicated that there were significant differences between types and for each PA category measured, revealing a continuum of PA levels by type and confirmed the four types within this continuum.

Discussion: The validated typology and the associated tool can be used to identify and implement built environment improvements and interventions aimed to support PA needs of older adults.

Keywords

older adults, physical activity typology, mobility, wellness, aging

Introduction

Encouraging physical activity (PA) for older adults remains a public health need. While PA rates for people 65 and older increased from 5.5% in 1998 to 13.9% in 2018 ([Centers for Disease Control and Prevention, 2019](#)), just over half (54.9%) do not meet the U.S. Department of Health and Human Service [USDHHS] physical activity guidelines. The USDHHS guidelines recommend 150 minutes moderate-intensity aerobic PA per week, muscle-strengthening activities at least 2 days per week, and balance training ([USDHHS, 2018](#)).

Remaining physically active benefits both physical and mental health ([USDHHS, 2018](#)), starting with making ADLs easier ([Roberts et al., 2017](#)). In addition, PA such as walking strengthens muscles and increases bone health, contributes to cardiorespiratory health and disease reduction, reduces the risk of dementia, and improves overall mental health

([USDHHS, 2018](#)). The benefits of regular PA, which continues as people age, often depend on a person's intent and ability to be physically active. The amount of PA may affect an older adult's sense of well-being and can be enhanced by social connections ([Fingerman et al., 2019](#)). In fact, [Rowe and Kahn \(1997\)](#) identify three dimensions for successful aging: avoiding disease and disability, maintaining high physical and cognitive function, and having sustained social engagement and productive activities. Adults who eat well, maintain a healthy weight, and remain physically active are

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more likely to remain healthy as they age in spite of their parents' or siblings' health in older age (Rowe & Kahn, 1997).

The built environment affects PA levels and the mobility range of older adults. Public health professionals and transportation planners use various methods of assessing the quality of a neighborhood's mobility, such as transit access, walking for errands, and socialization (Saelens et al., 2012). In a review, Bonaccorsi et al. (2020) found that neighborhood factors have either a positive or negative effect on older adult PA. For example, walkability, street connectivity, and overall access to destinations positively affect PA while unattractive scenery, inadequate street lighting, and traffic were barriers to PA (Bonaccorsi et al., 2020). Additionally, the Life-space Mobility construct can measure mobility ranges for older adults in five areas: bedroom, home, just outside home (i.e., yard or off the front porch), neighborhood, and broader community (Baker et al., 2003). Those who are less physically active and may not be able to reach their yard or beyond, or whose neighborhood offers a lower level of walkability and lack essential services such as health care facilities typically have a smaller range of spaces in which they engage, often affecting their outcome for healthy aging, especially through aging in place (Zambrana et al., 2019).

Older adults who reduce their levels of PA lose strength, agility, and ability, along with the interest in being physically active (Kuspinar et al., 2020). Thus, a way to define PA levels for older adults that serves as a tool to promote PA increases would be useful. Previous research tends to focus on the associations between environmental factors and PA of older adults, rather than developing a typology that attempts to promote PA. For example, a study of neighborhood characteristics for walkability, recreation, and socialization measures older adult participants' daily PA amounts and BMI, but does not include their inclination to be physically active (Adams et al., 2012). However, a previous study identified three types of older adults using semi-structured interviews of 27 study participants: exercisers, out-and-about-ers, and sedentary/solitary (Guell et al., 2018). The types are primarily based on the person's motivation to remain physically active, whether it be through traditional exercise or through a "busy" lifestyle, with follow-up discussions providing a deeper understanding of the person's motivation for being active or not. This study is limited by its small sample and oversimplifies the spectrum of older adults' PA levels.

Therefore, the purpose of this study was to validate the newly proposed four-type typology of older adults by PA shown in Figure 1: *Frail* older adults typically have neither the physical nor mental ability to be physically active; *Ambivalent* older adults' cumulative lifestyle or onset of an age-related loss of mobility reduces their interest in remaining physically active; *Aspiring* older adults may live in a place where walking is easy, such as nearby parks or trails and community centers, but may not routinely take advantage of

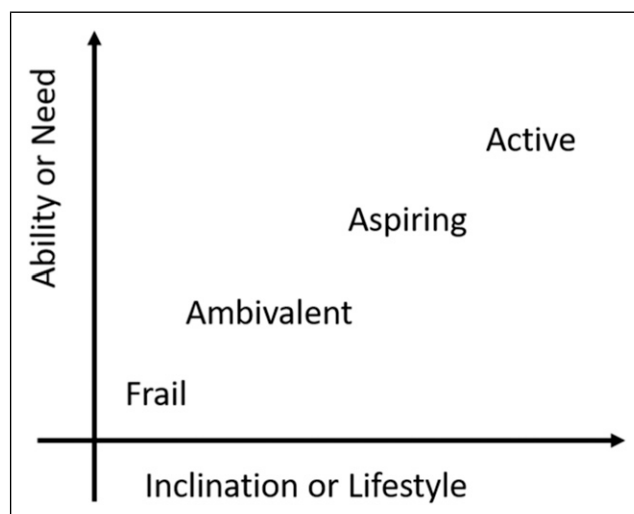


Figure 1. Proposed older adult typology-physical activity (OAT-PA).

them, preferring instead to take exercise classes; and *Active* older adults weave PA into their life's fabric, often living where walking or taking transit to everyday destinations is at-hand. Each type is defined by the intersection of two underlying assumptions: a person's physical and/or mental *Ability* to be active, even for people using a mobility device or with a cognitive disability; and a person's *Lifestyle* or *Life Circumstances*, such as where they live and economic circumstances.

Methods

Study Design

This mixed-method, purposive sampling study was embedded in an undergraduate aging and research course in which students conducted interviews as a part of this study. After completing the required research and ethics training, each student was required to interview older adults with one representing each of the following age groups: 50–59, 60–69, 70–79, 80–89, and 90–99; on average, students conducted 5 interviews each. Student researchers selected participants based on previous relationships (i.e., family) or newly established relationships developed through a service-learning opportunity, a required component of the course. A total of 232 participants were interviewed. All study procedures were approved by the University of Missouri-Kansas City Institutional Review Board.

Data Collection

A structured interview guide (see [Supplemental Materials](#)) was developed by the researchers to explore PA among older adults that builds on previous work such as the research of Jones et al. (2014) that underscores the benefit of biographical

interviews to help understand walking and cycling habits. The interview guide was comprised of 34 forced response and five open-ended questions and used skip logic. The interviews explored the following PA domains: (1) PA frequency; (2) active transportation; (3) home-based PA; and (4) community-based PA. Each participant's perceived PA level, health, approach to incorporating PA into their life, and demographic data were also collected.

Measures

Demographic variables. All demographic variables were categorical. In some cases, categories with small samples were collapsed. Participants who reported household incomes of \$125,000–\$149,000 and \$150,000 or more were combined to create one variable, \$125,000 or more. Asian, American Indian/Alaskan Native and Other race categories were collapsed into one variable, labeled as Other. Additionally, single/never married; life partner, live separately; and separated were combined to create the variable Other. Lastly, ZIP codes were recoded using the rural-urban commuting area codes (RUCA), a system to classify U.S. census tracts using measures of population density, urbanization, and daily commuting (U.S. Department of Agriculture, 2019).

Physical activity variables. To analyze PA variables, a sub-score was created for each of the broad PA categories explored: (1) PA frequency (i.e., frequency of sidewalk use within the neighborhood) was ranked on a 5-point Likert scale ranging from 0 = rarely or never to 4 = daily, with a maximum score of five; (2) active transportation was scored 1 point for each active transportation scenario selected (i.e., will walk to work, school, or to volunteer), a maximum of 5 points were earned in this category; (3) home-based PA (i.e., cleans the house and yard work) was scored 1 point for each home-based activity selected, a maximum of 5 points were earned in this category; (4) community-based PA (i.e., yoga or aerobics) were scored 1 point for each activity selected. A total of 19 options were provided, but a maximum of 5 points was scored for this category. A total PA score (maximum 20 points) was calculated summing each of the sub-categories.

Approach to physical activity. Lastly, the variable active approach, to describe one's approach to being physically active, was assessed by asking participants to select the statement that best describes their approach. Participants selected from the following options: (1) Consciously incorporates ways to be active most days; (2) Is more active with encouragement from family and friends or while on vacation; (3) Does not consciously incorporate being active into her/his daily routine; (4) Does not readily respond to encouragement from family and friends to be more active; or (5) Is not able to be physically active due to mental or physical limitations. Due to small sample sizes in options four and five and no statistically significant difference in overall PA levels within these groups,

the options were collapsed into one variable. Final categories were summarized as (1) Active, (2) Aspiring, (3) Ambivalent, and (4) Frail, which matches the hypothesized types.

Data Analysis

Univariate statistics were calculated for all demographic variables. A Kolmogorov–Smirnov test of normality was conducted and revealed significance ($p < .001$), indicating a non-normal distribution. Therefore, an independent-samples Kruskal–Wallis Test was conducted to determine significant differences between groups with the outcome variable of “approach to daily physical activity” to determine the older adult typology.

Results

Univariate Results

Table 1 presents the descriptive statistics for the sample aged 50 years and older ($n=232$). Purposive sampling allowed for similar distribution among the targeted age groups: 50–54 (15.5%), 55–59 (13.4%), 50–64 (10.8%), 65–69 (13.4%), 70–74 (16.8%), 75–79 (9.1%), 80–84 (12.9%), and >85 (8.2%). Participants were majority female (59.0%) and White (57.1%), followed by Black (22.0%) and Hispanic (10.3%). Participant incomes varied, with 22.7% having a household income of \$50,000–\$74,999, followed by 21.3% having less than \$25,000 household income. Participants tend to be married (58.6%) and live in ZIP codes categorized as “metropolitan area core: primary flow within an urbanized area” using the RUCA code conversions. When asked what approach to being active best described themselves, the most common approach participants selected was consciously incorporates ways to be active most days (45.4%), followed by does not consciously incorporate daily PA or readily respond to encouragement from family and friends to be more active. On a scale of 1–10, 1 being lowest and 10 being highest, participants' mean perceived PA level was 5.4 ($SD=2.6$) and a mean score of 6.6 ($SD=2.2$) for perceived health.

Kruskal–Wallis Test

The sample was divided into four typology categories based on self-identified approach to being active labeled as Frail, Ambivalent, Aspiring, and Active. A Kruskal–Wallis Test revealed significant differences between typology groups for PA behaviors including the total PA score ($H=57.7, p < .001$), and each sub-category: home-based PA ($H=46.7, p < .001$), community-based PA ($H=32.4, p < .001$), exercise frequency ($H=84.3, p < .001$), and active transport ($H=21.2, p < .001$). When examining demographic variables, we found that typology categories were significantly different by age ($H=13.0, p < .01$) and income ($H=21.0, p < .001$). However, age

Table 1. Summary of sample characteristics.

Variable	N (%)	Variable	N (%)
Gender		Race	
Male	93 (40.6)	White	133 (57.1)
Female	135 (59.0)	Black	(22.0)
Age		Hispanic	24 (10.3)
50–54	36 (15.5)	Other	24 (10.3)
55–59	31 (13.4)	Income	
60–64	25 (10.8)	Less than \$25,000	45 (21.3)
65–69	31 (13.4)	\$25,000 to \$34,999	18 (7.3)
70–74	39 (16.8)	\$35,000 to \$49,999	35 (16.6)
75–79	21 (9.1)	\$50,000 to \$74,999	48 (22.7)
80–84	30 (12.9)	\$75,000 to \$99,999	24 (11.4)
>85	19 (8.2)	\$100,000 to \$124,999	20 (9.5)
Marital status		\$125,000 or more	21 (10.0)
Married/Domestic partner	136 (58.6)	Perceived PA level*	5.4 (2.6)
Widowed	51 (22.0)	Perceived health*	6.6 (2.2)
Divorced	20 (8.6)	RUCA	
Other	25 (10.8)	Metropolitan area core: primary flow within an urbanized area (UA)	175 (76.1)
Active approach		Metropolitan area high commuting: Primary flow 30% or more to a UA	33 (14.3)
Frail	25 (10.9)	Non-metropolitan areas	15 (6.1)
Ambivalent	59 (25.8)	Other/International	7 (3.1)
Aspiring	41 (17.9)		
Active	104 (45.4)		

*Mean (SD).

only significantly differed between Frail and Active ($H=3.61$; $p<.01$) and Frail and Aspiring ($H=2.45$, $p<.05$). There were no significant differences found for other demographic variables (RUCA, Race, Marital Status). A Dunn–Bonferroni post hoc analysis using a Bonferroni-adjusted alpha level for multiple tests were used to compare all pairs of groups and are presented in [Table 2](#). For the total PA score, the typology category Frail was significantly different than Aspiring ($p<.001$) and Active categories ($p<.001$), but not the Ambivalent category. PA scores for the Ambivalent category were significantly different than Active ($p<.001$), but not Frail nor Aspiring.

Discussion

The purpose of this study was to validate or modify a typology of older adults by PA. The analysis presumed a range of PA levels based on current life circumstances and motivations for being physically active. Overall, the findings are consistent with the assumptions about ability and lifestyle underlying the proposed typology. We found that older adults could accurately self-identify into one of the four hypothesized types (Frail, Ambivalent, Aspiring, and Active) based on their PA levels. Significant differences in one's active approach were found among an overall PA total score and each of the four PA sub-scores (PA frequency, active transportation, home-based PA, and community-based PA).

Further, the post hoc analysis revealed that typology is a continuum rather than distinct categories, as each level had some shared variability with adjacent levels of the typology, but each level was significantly different than any skip-level typology. While we did find significant differences between types by age, which would be expected, differences were only seen between Frail and Active and Frail and Aspiring. These findings indicate that age may play a factor, but one's PA level better predicts one's type than age alone. Using PA levels as the primary factor in this typology allows users to avoid making assumptions based on aging stereotypes.

The present four-type typology proposes a nuanced approach to understanding PA levels for older adults and emphasizes four distinct types along a continuum. These findings add to the previous literature to establish an older adult PA typology, such as [Guell et al.'s \(2018\)](#) three-category typology. The proposed typology similarly reflects the type of cyclist typology that assesses comfort and confidence in one's ability to cycle in different settings by identifying with one of four types ([Geller, n. d.](#)). Further, the simplicity of the proposed tool shown in [Table 3](#), like the type of cyclist tool, makes it ideal to readily use with diverse populations in a multitude of settings.

This study may be limited by using 51 researchers to conduct interviews and by the potential relationship between the interviewers and interviewees. Moreover, the study sample may not be generalizable, as participants were

Table 2. Kruskal–Wallis Test with a Dunn–Bonferroni post hoc analysis results for typology categories by PA variables.

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig	Adj. Sig. ^a
Physical Activity Total					
Frail-Reluctant	−37.614	16.203	−2.321	.020	.122
Frail-aspiring	−68.219	17.004	−4.012	.000	.000
Frail-active	−96.085	15.324	−6.270	.000	.000
Ambivalent-aspiring	−30.605	12.634	−2.422	.015	.093
Ambivalent-active	−58.471	10.262	−5.698	.000	.000
Aspiring-active	−27.866	11.485	−2.426	.015	.092
Exercise frequency					
Frail-ambivalentt	−35.243	14.982	−2.352	.019	.112
Frail-aspiring	−81.375	15.965	−5.097	.000	.000
Frail-active	−107.226	14.061	−7.626	.000	.000
Ambivalent-aspiring	−46.132	12.870	−3.584	.000	.002
Ambivalent-active	−71.983	10.414	−6.912	.000	.000
Aspiring-active	−25.851	11.785	−2.194	.028	.170
Active transportation					
Frail-ambivalent	−33.483	13.465	−2.487	.013	.077
Frail-aspiring	−53.539	12.580	−4.256	.000	.000
Frail-active	−53.659	14.318	−3.748	.000	.001
Ambivalent-aspiring	−20.056	9.212	−2.177	.029	.177
Ambivalent-active	−20.175	11.472	−1.759	.079	.472
Aspiring-active	.120	10.419	.011	.991	1.000
Home-based physical activity					
Frail-ambivalent	−41.079	16.339	−2.514	.012	.072
Frail-aspiring	−60.650	17.117	−3.543	.000	.002
Frail-active	−89.936	15.400	−5.840	.000	.000
Ambivalent-aspiring	−19.571	12.630	−1.550	.121	.728
Ambivalent-active	−48.857	10.182	−4.798	.000	.000
Aspiring-active	−29.286	11.389	−2.571	.010	.061
Community-based physical activities					
Frail-ambivalent	−36.786	15.442	−2.382	.017	.103
Frail-aspiring	−53.503	16.420	−3.258	.001	.007
Frail-active	−75.040	14.427	−5.201	.000	.000
Ambivalent-aspiring	−16.718	13.157	−1.271	.204	1.000
Ambivalent-active	−38.254	10.565	−3.621	.000	.002
Aspiring-active	−21.537	11.949	−1.802	.071	.429

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

^aSignificance values have been adjusted by the Bonferroni correction for multiple tests.

primarily located in one geographic region. Lastly, this study took place during the COVID-19 pandemic, which may have impacted participants' PA levels and how they obtained PA. The study is strengthened by the large sample size and the in-depth analysis of PA. The study is also strengthened by the diverse sample (i.e., age, race, and income). Future studies should test the typology on a more geographically diverse sample to confirm results.

Implications for Practice

The main findings confirm the proposed typology and suggest a few next steps. First, streamline the process used for

identifying older adults by type. While the full questionnaire can be used, it requires data analysis tools that may not be easily available. Instead, a simple self-identification tool based on easy-to-understand definitions and examples may be as useful. Self-identification can be a useful “first step” for older adults to become aware of their PA level. It also allows public health professionals and planners to understand the mix of older adults by type, increasing the likelihood of effective engagement.

Second, typologies are a helpful tool for different sectors to plan for services, programs, and designs, especially when typical percentage breakouts are identified. The Geller typology of bicyclists was tested in numerous geographies and

Table 3. Using the OAT-PA in Active Transportation Planning and Public Health Programming.

	Likely Perspective on PA	Change in Perspective on PA	Messaging	Recommendations	Strategies and Other Information
Frail	PA is a memory and there is disbelief that PA is possible; some may be committed to walking, albeit with a mobility device; some caregivers may encourage PA by accompanying the person on walks, etc.	Beginning to engage in PA, appropriate to their physical condition, or increase slightly the frequency of their PA.	Focus on benefits of PA including socialization, regaining some mobility and sense of independence, as well as physical benefits. Depending on the built environment, highlight existing infrastructure that makes PA possible. There are different ways to be physically active, including chair-based activities and those in which the person accompanies someone who is more physically active	-If living in an institutional setting, recommend a walking pathway with hard surface, benches, etc.; recommend walking or other PA programs; develop story-telling opportunities for older adults to talk about PA when they were younger and consider what is possible now; work with family members and caregivers to identify ways to help older adults with PA. Conduct a walk audit with the older adults to identify things that work and don't work, even if the older adult is using a mobility device. -Work with the local Cycling Without Age or similar organization to offer outdoor movement experiences beyond what the person is able to do independently. -Encourage chair-based activities (Klempel et al., 2021)	-Work with care professionals and providers to learn what opportunities exist for PA at the residential facility and how each person reacts to it. -Learn and share opportunities for PA by nearby senior centers or AAA. -Work with the local parks and recreation department to design programs that incorporate settings (such as outdoors) that allow older adults in this type to begin to be physically active
Ambivalent	Low level of thought about ways to be physically active. Person may walk with family or friends if prompted; may take a class periodically. May do yard work such as mowing and gardening. Opportunities for PA are not a factor in determining where to live, have social interaction, or vacation. Easy access by motor vehicle is a strong consideration. May have safety concerns (both motor vehicles injury and personal safety)	Understand the benefits of PA both physically and socially. Begin to make decisions about daily activities that include more PA. Find ways to mitigate safety concerns that are barriers to PA.	PA is good for your health. You don't have to run a marathon to be physically active. Start by walking a few blocks, then gradually add more. Join or form a walking group of people with shared interests so you have something to talk about. There are opportunities for more PA in your daily life	-Develop a calendar of increased PA based on three or four goals. Gamify the calendar, if possible. -Group daily errands and tasks so that the person can park once and walk to each place	-Find ways to make PA opportunities that are close to home so that traveling to a location is not needed. -If safety is a strong disincentive, include local law enforcement in the conversation. -Work with nearby schools for intergenerational activities such as walking school buses

(continued)

Table 3. (continued)

	Likely Perspective on PA	Change in Perspective on PA	Messaging	Recommendations	Strategies and Other Information
Aspiring	More aware of and desire for PA. Regularly includes PA, such as taking a class. May live in an area with opportunities for PA such as sidewalks and trails. Will likely drive to exercise but may walk with friends	Validation for current levels of PA. Show how more PA can be accomplished with some simple changes. Encourage participation in a walk audit to identify ways to increase PA safety where they live and to close-by destinations	Reaffirm and celebrate the current levels of PA and encourage finding ways to increase just a bit. Challenge person to re-think what they do a couple of days to identify how they can routinely increase the amount of PA.	-Identify missing connections that if made would motivate more PA. -Encourage informal walking groups designed around common interests, such as going to a coffee shop, walking dogs (who get along), going grocery shopping or consignment store shopping etc.	-Hold small group discussions about PA levels and what it would mean to increase PA.
Active	Older adults incorporate walking, bicycling, and other types of PA into their lives. Often live in a place that makes PA easier	Continue to find ways to remain physically active as they age and life circumstances change	Focus on rates of walking, biking, etc. In their neighborhood; identify what's available to make PA possible; ask what else is needed to keep them physically active	-Update and expand walking, biking, and transit access networks. -Develop and promote walking and cycling programs and groups; mentorship programs for A spiring and A mbivalent older adults; F rail older adults. -Conduct discussion groups to tease out age-based changes that may require older adults to adapt how they are physically active. -Connect with or start cycling without a program	-Include residents in marketing campaigns; actively engage in jurisdictional planning efforts; using residents as leaders in the planning process and pay stipends. -Hold focus groups at bike shop, running or walking shoe stores; hold walking focus groups, perhaps using "community Conversations" (dbITilde CORE) materials to further the understanding among those traveling in different modes. -Ask older adults to do a self-assessment of their PA expectations and abilities, as they recognize strength and stamina changes

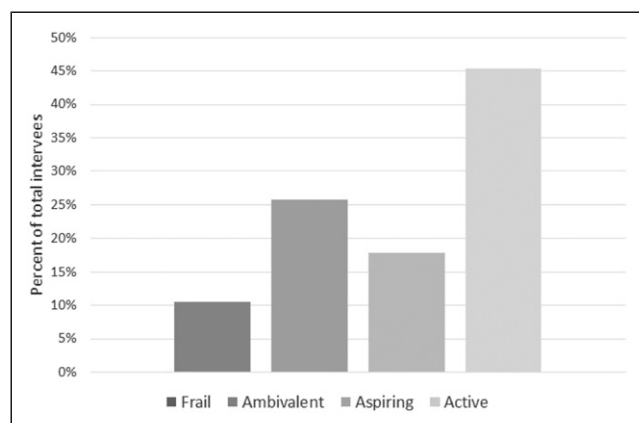


Figure 2. The proportion of interviewees by type.

demographics before settling on a typical percentage split. While this study confirms differences in PA levels by one's self-identification into one of the four types, the resulting percentage split by type, shown in Figure 2, cannot be considered typical. Broader use of the tool will help establish a typical percentage split as a beginning place for public health professionals and planners.

Third, the typology is best used at the neighborhood level (census block or census tract), especially where the percentage of residents 65 and over is at or above the jurisdictional average or in a setting where older adults are a primary population, such as older adult residential communities. As stated above, the recommended approach is to use a self-identification process instead of the full questionnaire that was used for this study.

Finally, a tool for engaging older adults by type will increase the likelihood of meaningful changes in circumstances that result in PA increases. The researchers have developed a tool and are vetting it with prospective users. The draft tool, shown in Table 3, emphasizes understanding the perspective on PA for people in each type, then developing messages based on that understanding so they are likely to increase PA.

Conclusion

In conclusion, this study provides transportation planners and public health practitioners with a typology tool to identify older adults' PA levels and inclinations to be active. The results from using the typology will aid in built environment improvements and interventions both aimed to support PA needs of older adults. Key to this is understanding why older adults' PA levels are what they are, then working incrementally to encourage lifestyle changes that will increase PA and its benefits. Simplifying the questionnaire used in this study to make it easier to administer or using a self-identification tool with well-defined types is needed to increase use of the typology and establish a general breakout of PA type for most communities.

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Amanda Grimes and Carol Kachadoorian are joint senior authors

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IRB Approval

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Supplemental Material

Supplemental material for this article is available online.

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