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# Impact of mobility restrictions on active aging; cross-sectional associations and longitudinal changes parallel to COVID-19 restrictions

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## Highlights

- Individuals' active aging refers to an overall active approach to life
- Active aging covers one's will, ability, opportunity and extent of doing activities
- Individuals with limited neighborhood mobility obtain lower active aging scores
- Active aging scores declined similarly regardless of baseline neighborhood mobility
- Engagement in several activities is possible despite limited neighborhood mobility

## Abstract

**Background:** Meaningful activities can be done in or around home, but opportunities for participation and active aging decrease when moving in smaller areas. Active aging refers to having an active approach to life in line with one's goals, ability and opportunities. In adults over 75 years with different baseline neighborhood mobility levels, we studied active aging scores two years prior to and amid COVID-19, when governments restricted mobility of residents to slow the COVID-19 outbreak.

**Methods:** AGNES cohort data were collected in 2017-2018 and spring 2020. Individuals were queried about their will, ability, and opportunity, and extent of doing 17 activities, and subsequently, item, composite and sub-scores of active aging were computed. Neighborhood mobility was assessed as frequency of moving in or beyond own neighborhood (limited, regular, daily=reference). Associations were studied using Generalized Linear Models (cross-sectionally, n=1007) and General Estimating Equations (prospectively, n=774).

**Results:** Participants with limited baseline neighborhood mobility had lower active aging scores than those with daily mobility, but the decline over time was similar. Some item scores on opportunity to act and extent of doing, e.g. for making one's day more interesting and advancing matters of faith or worldview, were better retained amid COVID-19 by those with limited mobility, attenuating group differences.

**Conclusions:** Active aging scores were somewhat compromised in individuals with limited neighborhood mobility, but opportunities for and engagement in several activities seemed to be better retained amid COVID-19 than for those with daily mobility. Thus, active aging may be possible despite mobility restriction.

**Keywords:** Mobility limitation, participation, life-space, aging, Coronavirus

# 1. Introduction

In older populations, participation in meaningful activities contributes to quality of life (Rantanen et al., 2019). In line with the theories underlying life-space mobility research, opportunities to participate in meaningful activities increase with more frequent movement through larger areas (Baker et al., 2003). Older adults with greater life-space mobility, thus moving more frequently through larger spatial areas, typically have higher levels of physical (Tsai et al., 2015) and social activity (Rosso et al., 2013). However, we are unaware of research studying such associations, while assessing older adults' activity more comprehensively, including a diverse range of activities in the physical, social and cultural domain.

Active aging as defined from the perspective of the older individual entails activities aligned with one's goals, capacity and available opportunities (Rantanen et al., 2019). This concept was inspired by active aging policy concepts outlined by the World Health Organization at the level of societies (World Health Organization, 2002a) and the International Classification of Function (World Health Organization, 2002b). For assessing older individuals, the University of Jyväskylä Active Aging Scale (UJACAS) was developed (Rantanen et al., 2019). For the individual, active aging represents an overall active approach to life, and the assessment provides a comprehensive picture of activities in old age. Seventeen items describing individual activities (such as crafting and DIY, participating in events, practicing to keep physically fit, advancing matters in one's own life and the community) from four different perspectives (will, ability, and opportunity to act, and extent of doing) comprise the scale. Since its development, higher UJACAS composite scores have been associated with higher mobility performance, coping ability, life-space mobility, and quality of life in older adults (Rantanen, Eronen et al., 2020; Siltanen et al., 2020). Nevertheless, as some activities on the scale, such as exercising mind and memory, using computer and pad, taking care of personal appearance, are typically done at home, it is likely that these are independent of mobility limitation.

In spring 2020, governments implemented protective measures to slow the COVID-19 disease outbreak by instigating mobility and activity restricting regulations (ECDC, 2020. URL: <https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-rapid-risk-assessment-coronavirus-disease-2019-ninth-update-23-april-2020.pdf>). In Finland, organized activities were cancelled, and communal facilities for sports and culture were closed. Furthermore, adults over the age of 70 were advised to avoid in-person contacts with persons outside of their own household for as much as possible. In an instant, opportunities to engage in out-of-home activities, especially those with a social component, drastically changed. Early COVID-19 research confirms that mobility and activity behavior of older adults changed, typically reporting declines in physical activity and active aging (Rantanen, Eronen et al., 2020; Suzuki et al., 2020; Visser et al., 2020), but with large inter-individual variation. Declines in life-space mobility associated with the COVID-19 situation were reported (Perracini et al., 2021; Rantanen, Eronen et al., 2020), and these exceeded the expected age-related decline over a two-year period reported

earlier (Rantakokko et al., 2016;Rantanen, Eronen et al., 2020). Loss of social engagement (Smith et al., 2020) and feelings of insecurity (Trzebinski et al., 2020) may have caused feelings of loneliness and grief (de Jong et al., 2020) in the midst of the first COVID-19 wave. Moreover, externally evoked activity restrictions and concurrent fears regarding one's own health, may have elicited re-evaluation of one's goals and values, as is typical in times of adversity (de Jong et al., 2020;Trzebinski et al., 2020). In turn, this may be reflected in activities of active aging. However, not all individuals may be affected equally, and studying changes concurring with the COVID-19 situation among subgroups in the population may provide important insights in older adults' adaptability.

Older adults are accustomed to adapting their activity to gradually declining health and function with age. Individuals try to hold on to activities in line with their values and goals (Saajanaho, Rantakokko et al., 2016), while also aiming to preserve their energy balance (Baltes and Baltes, 1990). Adaptation to reduce the strain of the performance may include modification of the way in which the activity is performed (e.g. walking smaller distances at a time) or of the environment (e.g. using a walking aid) (Lawton and Nahemow, 1973;Skantz et al., 2020). Ultimately, it may also involve dropping any activity taking too large a toll, such as in the presence of walking limitation (Saajanaho, Viljanen et al., 2016). The COVID-19 situation elicited an instant change in the environment, requiring adaptation from the individual. Albeit different in nature, this situation may resemble catastrophic changes occurring e.g. due to severe illness or injury. It has been reported that catastrophic changes may be harder to adapt to than more gradually occurring changes, thus coinciding with greater declines in function and quality of life (Guralnik et al., 2001;Rantakokko et al., 2016).

Our study aims were two-fold. 1) We studied in the pre-COVID-19 era differences in individuals' active aging scores between community-dwelling adults over the age of 75 according to their baseline neighborhood mobility (limited, regular vs. daily; cross-sectional analyses). 2) We studied how active aging scores changed over the 2 years leading-up to COVID-19 situation in these older adults with varying levels of baseline neighborhood mobility (prospective analyses). For both study aims, associations were studied for UJACAS composite and sub-scores, and at the level of separate items to look for more subtle changes and identify potential adaptations and activity replacements. So far, individual UJACAS item scores have not been studied.

## 2. Materials and methods

### 2.1. Study design and participants

These are cross-sectional and prospective analyses of data of the 'Active aging – Resilience and external support as modifiers of the disablement outcome' (AGNES) cohort. The AGNES study methods and recruitment have been published previously (Portegijs et al., 2019;Rantanen et al., 2018). In short, 75-, 80-, and 85-year-old men and women, living independently in Jyväskylä, Finland, were invited to

participate in the study. In 2017 and 2018, in total 1021 persons participated in the baseline home interview and / or completed a postal questionnaire. Exclusion criteria were unwillingness to participate and inability to communicate. In May and June of 2020, after about two months of government imposed COVID19-related restrictions in Finland, all participants of the baseline cohort not known to have died or withdrawn consent were contacted again and asked to complete a postal questionnaire, as described earlier (Rantanen, Eronen et al., 2020). Of the 985 invited, 809 participants (82%) were willing and able to participate and returned the questionnaire. COVID-19 respondents were somewhat younger, more often female, and had better health and function (Rantanen, Eronen et al., 2020) compared to those participating at baseline only. This work has been carried out in accordance with the Declaration of Helsinki. The Ethical Committee of the Central Finland Health Care District provided an ethical statement about both study phases. Participants signed an informed consent prior to baseline data collection and provided consent by returning the COVID-19 questionnaire.

## 2.2. Main measures

**Active aging** from the perspective of the older individual was assessed with the University of Jyväskylä Active Aging Scale (UJACAS) (Rantanen et al., 2019). Participants were asked to rate 17 activities, representing different domains in the International Classification of Function (World Health Organization, 2002b), from four different perspectives; that is, will to act (A), ability to act (B), opportunities (C) to act, and the extent of doing (D). The items listed are: 1) crafting or DIY, 2) practicing musical and artistic pursuits, 3) participating in events to do with studying or clubs or associations, 4) enjoying the nature outdoors, 5) practicing to keep physically fit, 6) exercising mind and memory, 7) using a computer or pad, 8) helping or supporting others, 9) maintaining friendships, 10) meeting new people, 11) advancing matters in one's own life, 12) advancing societal or communal matters, 13) making one's days interesting, 14) making one's home cozy and pleasant, 15) taking care of one's personal appearance, 16) taking care of personal finances, and 17) advancing matters of faith or worldview. Each item was rated on a 5-point response scale (0-4), with higher scores indicating higher will, better ability or opportunities to act or greater extent of doing, respectively. Item scores were summed for each perspective (**sub-score**, range 0-68) and to obtain a **composite score** (range 0-272). A total of two missing items for each sub-score was allowed and these were imputed with the average of remaining items.

**Neighborhood mobility** was assessed as part of the University of Alabama at Birmingham Study of Aging Life-Space Assessment (Baker et al., 2003;Portegijs, Iwarsson et al., 2014). Participants were asked their frequency of movement at different life-space levels, including the home, yard, neighborhood, town and beyond town. Response options were 1) not at all, 2) 1-3 times a week, 3) 4-6 times a week, 4) daily) and categorized as limited (category 1-2), regular (category 3), and daily (category 4). Only the highest frequency of movement reported at any one of the three widest life-space areas (neighborhood, town or beyond town) was used as a proxy for neighborhood mobility.

### 2.3. Baseline covariates

**Age** and **sex** were derived from the Digital and Population Data Services Agency at the time of study recruitment. During the baseline home interview, self-reported number of **chronic conditions** was obtained from a list of 10 disease categories including 34 diseases (Rantanen et al., 2018). **Lower extremity physical performance** was assessed using the Short Physical Performance Battery (SPPB; range 0-12; higher scores indicate better function) comprising three components (standing balance, 3m walking speed, and 5 times repeated sit-to-stand test) (Guralnik et al., 1994). **Cognitive status** was assessed using the Mini-Mental State Examination (MMSE; range 0-30; higher scores indicate better function) (Folstein et al., 1975). Socio-economic status was assessed using a single question on **perceived financial situation** with a 5-item response scale, which was categorized as good (good or excellent) vs. poor to fair (very poor, poor or fair). **Living situation** (alone vs. with others) and **housing type** (family home vs. flat) were assessed with one question. **Car use** as a driver and as a passenger was compiled from two separate questions in the baseline postal questionnaire with response options ranging from rarely to daily. One dichotomous variable was created (car use at least a few times a month vs. rare car use).

### 2.4. Statistical analyses

Due to extremely skewed variable distributions, both at baseline and amid COVID-19, item scores for the UJACAS ability to act perspective were dichotomized into high (category 4) and lower (category 0-3). Item scores for the will and opportunity to act and extent of doing perspectives were used as continuous variables, similarly as the UJACAS composite and sub-scores.

In baseline analyses, all participants with valid neighborhood mobility and UJACAS scores were included (n=1007). In prospective analyses, participants with baseline neighborhood mobility and UJACAS composite scores at both time points were included (n=774). Both for the full baseline sample and the prospective sub-sample, differences in participant characteristics between the neighborhood mobility groups were tested at baseline using Chi-square tests and ANOVA-tests depending on variable distribution. Differences in UJACAS and neighborhood mobility variables between participants and non-respondents of the prospective analyses were tested with independent T-tests and Chi-square tests.

Generalized Linear Models (GLM) with identity link function were used to test associations between neighborhood mobility and UJACAS active aging composite and sub-scores cross-sectionally at baseline. Base models were adjusted for age, sex, and all models were subsequently adjusted in two steps adding 1) health and function (chronic conditions, MMSE and SPPB scores), and 2) personal and environmental resources (living and housing situation, car use, financial situation). Similarly, these GLM models were run for each individual UJACAS item; for will and opportunity to act and extent of doing perspectives

using identity link function, and for the dichotomized ability to act perspective items using a logistic link function.

In the prospective analyses, rates of change in active aging scores within individuals were estimated using General Estimating Equations (GEE) models adjusted for sex and age only. Adding other baseline variables to models typically did not improve model fit (results not shown). GEE models with identity link function were used to study changes over time in UJACAS composite and sub-scores according to groups of neighborhood mobility. Changes in UJACAS item scores were also studied using GEE models with identity link functions for will and opportunity to act and extent of doing perspective items, and with logistic link function for the dichotomized ability to act perspective items.

### 3. Results

Among baseline participants, lower neighborhood mobility was associated with higher age, a higher proportion of women and those living alone, and poorer health, function, and financial situation, and lower car use (Table 1). Group differences were similar for the prospective sub-sample, except for self-reported financial situation ( $p=.098$ ). Participants dropping out of the prospective study overall had slightly lower UJACAS scores (composite and sub-scores) at baseline than those continuing participation (independent T-test  $p<.001$ ), but their neighborhood mobility did not differ (Chi-square  $p=0.104$ ).

#### 3.1. UJACAS composite score and sub-scores by neighborhood mobility

**Baseline.** At baseline, UJACAS composite score was on average lower for those with more limited neighborhood mobility than for those with daily mobility (ANOVA  $p<.001$  for all; Table 1). GLM confirmed this (limited  $B=-31.1$  95%CI= $-36.1$ -  $-26.0$ ; regular  $B=-12.7$  95%CI= $17.1$ -  $-8.4$ ; daily=ref; Supplementary Table A.1.), and showed that further adjustment for health and function, and other personal and environmental resources attenuated the association somewhat, but it remained statistically significant (limited  $B=-15.7$  95%CI= $-20.6$ -  $-10.8$ ; regular  $B=-8.4$  95%CI= $-12.3$ -  $-4.5$ ; daily=ref). Similarly, limited neighborhood mobility was associated with lower UJACAS sub-scores in all GLM models ( $p<.001$  for all), with the greatest difference found for opportunity to act.

**Amid COVID-19.** From baseline to COVID-19, UJACAS composite score declined on average (GEE time  $B=-25.3$  95%CI= $-27.4$ -  $-23.2$ ), but the change over time was similar in groups according to neighborhood mobility (group\*time interactions not statistically significant), thus retaining baseline group differences (limited  $B=-34.7$  95%CI= $-41.3$ -  $-28.1$ ; regular  $B=-13.1$  95%CI= $-18.2$ -  $-8.1$ ; daily=ref; Figure 1). Results were similar for all UJACAS subscales.



### 3.2. Analyses on individual items

**Baseline.** Figure 2 show that individual UJACAS item scores were typically lower for those with limited neighborhood mobility than for those with daily mobility. GLM models showed that group differences for the will to act perspective and extent of doing tended to be less than 0.5 point between groups, even though most differences were statistically significant (Supplementary Tables A.2. and A.3.). Group differences for most opportunity to act items exceeded this level and for all ability to act items the OR values declined reduced by 0.5 at least (Supplementary Tables A.4. and A.5.). Items of crafting and DIY (1A will), exercising mind and memory (6A will, 6D extent), using computer and pad (7A will) were not statistically significantly associated with neighborhood mobility when models were adjusted for age and sex only. Following further adjustment for health and function, and other personal and environmental resources, group differences were attenuated and no longer statistically significant for items of crafting and DIY (1C opportunity), musical and artistic pursuits (2B ability, 2D extent), exercising mind and memory (6B ability, 6C opportunity), using computer and pad (7B ability, 7C opportunity, 7D extent), helping and supporting others (8D extent), advancing life matters (11A will, 11B ability, 11C opportunity) and societal and communal matters (12A will), and taking care of personal appearance (15B ability, 15D extent) and personal finances (16A will, 16C opportunity, 16D extent).

**Amid COVID-19.** According to the GEE models, UJACAS item scores typically declined from baseline to COVID-19 (Table 2 and 3 time effect, and Figure 3), and item scores remained at a lower level for those with more limited than for those with daily neighborhood mobility. Even statistically significant changes rarely exceeded 0.5 points for items of will to act and extent of doing, but declines for items of ability to act (OR declining at least by half) and opportunity to act (change >0.5 points) were typically larger. For a few items the change over time was not statistically significant overall, that is, for item crafting and DIY (1B ability, 1D extent), practicing to keep physically fit (5B ability, 5D extent), taking care of personal appearance (15D extent) and personal finances (16C opportunity, 16D extent). For enjoying the nature outdoors, ability to act (4B) the item score increased overall over the follow-up. The extent of enjoying the nature outdoors (4D) declined over time in the group with limited mobility, but increased for those with regular neighborhood mobility (group\*time interaction) compared to no change in the daily mobility group. The will to enjoy the nature outdoors (4A), declined overall, but comparatively less for those with regular neighborhood mobility, and the same was true for will to practice to keep physically fit (5A). Other group by time interactions typically indicated smaller declines over time for those with limited mobility relative to those with daily neighborhood mobility for the following items: participating in events (3D extent), helping and supporting others (8B ability, 8C opportunity), meeting new people (10C opportunity), making days more interesting (13C opportunity), and advancing matters of societal and communal matters (12D) and in accordance with one's faith or worldview (17C opportunity). The ability to make home cozy and pleasant (14B) declined comparatively less for those with regular mobility than for those with daily

neighborhood mobility. For opportunity to craft and DIY (1C), a comparatively larger decline in item score over time was found for those with limited than for those with daily neighborhood mobility.

## 4. Discussion

For an individual, active aging is an active approach to life, which is suggested to maintain or promote well-being (Rantanen et al., 2019). This study shows that pre-COVID-19 active aging scores were somewhat compromised in individuals with more limited neighborhood mobility, but compared to those with daily mobility, differences in will to act and extent of doing were generally small for specific activities. From baseline to amid COVID-19, individuals' active aging composite and sub-scores as well as item scores declined overall and typically similarly in the groups according to neighborhood mobility. However, group differences for items assessed from the opportunity to act and extent of doing perspectives tended to become less pronounced. This finding may suggest that activities of older adults with greater neighborhood mobility were more affected by COVID-19 or that those with more limited neighborhood mobility were better able to identify opportunities for different activities close to home and thus, maintaining their activity.

Previous research showed that amid COVID-19, declines in mobility and a range of activities were generally reported (Perracini et al., 2021; Suzuki et al., 2020; Visser et al., 2020). Active aging composite scores assessed from the perspective of the individual declined overall as we reported earlier (Rantanen, Eronen et al., 2020), and the current study showed that declines were similar regardless of baseline neighborhood mobility. Due to the novelty of the UJACAS scale, reference ranges of changes in active aging scores over time have not yet been reported (Rantanen et al., 2019; Rantanen, Eronen et al., 2020), nor have individual items been studied separately. When looking at individual UJACAS items, declines were not consistently found. As clinically meaningful changes are unknown, it is unclear to what extent these changes in scores are due to normal aging or due to protective measures implemented to prevent the spread of COVID-19. Still, changes in UJACAS item scores over time seemed to be largely in line with expected changes following the protective measures implemented. Thus, the extent of doing typical out-of-home activities with a social component (e.g. participating in events to do with studying or clubs or associations, meeting new people, and advancing societal or communal matters) declined most clearly. Acting on activities involving social contacts may have been perceived as undesirable due to fears related to the COVID-19 disease, as these may involve physical contacts with people outside of the household. Furthermore, opportunities to engage in such activities may have also been compromised by the protective measures effectuated by the government, e.g. by closure of meeting places and cancellations of events. In line with expected changes following the protective measures implemented, overall declines were not reported for the extent of doing activities possible to do in the open air (e.g. practice to keep

physically fit, enjoying the nature outdoors) or independently at home (e.g. crafting and DIY, and taking care of external appearance and personal finances).

For practicing to keep physically fit, opportunities to act declined over the follow-up, but the item scores assessed from the other perspectives remained fairly stable over time. Amid COVID-19, when sport facilities were closed, home exercise or briskly walking in nature was possible and even encouraged by the government, thus enabling older people to physically exercise. Furthermore, the current data suggest that physical activity behavior increased during the follow-up based on self-report measures of physical activity levels (Leppa et al., 2021 (in press)) and number of physical exercise destinations used by participants (Portegijs et al., 2021). Increases in physical activity were previously reported in adult populations (Constandt et al., 2020; Knell et al., 2020), but in older populations, previous studies typically reported declines in levels of physical activity amid COVID-19 (Suzuki et al., 2020; Visser et al., 2020), especially among those with lower activity levels at baseline. In the current study, the extent of change in any of the items for practicing to keep physically fit was similar regardless of baseline neighborhood mobility. These diverging findings may be at least partly explained by variation in concepts underlying different physical activity measures and protective measures implemented by governments in different countries, which in some countries included curfews (ECDC, 2020. URL:

<https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-rapid-risk-assessment-coronavirus-disease-2019-ninth-update-23-april-2020.pdf>), thus prohibiting also out-of-home physical exercise.

Nature is one of the most commonly reported environmental facilitators for outdoor mobility reported by Finnish older adults (Rantakokko et al., 2015). International studies amid COVID-19 reported increased importance of parks and frequency of visitations for the general population, when other activity options were limited (Geng et al., 2020; Grima et al., 2020). Due to use of less restrictive regulations by the Finnish government, these changes seemed more modest in Finland (Geng et al., 2020). The current study in older adults reports overall marginal changes over the follow-up in items on enjoying the nature outdoors. However, for the ability to act perspective, and to some extent for the opportunity to act perspective, diverging trends were found for the groups according to neighborhood mobility. Those with limited neighborhood mobility reported average declines, and those with regular or daily mobility increases or no change in item scores, respectively. The COVID-19 situation may have changed participants' perception of accessing outdoor nature areas. For those with limited neighborhood mobility throughout the follow-up, ability and opportunities for enjoying the nature outdoors were compromised, possibly due to having fewer resources available for the day (Schrager et al., 2014) and their preferences regarding attractive features of nature (Keskinen et al., 2018). For those with more regular or daily neighborhood mobility, ability and opportunities for enjoying the nature outdoors may have improved due to lack of competing activities.

Activities that remained most stable during the COVID-19 situation were crafting and DIY, and taking care of external appearance and personal finances. Overall changes for the items of exercising mind and memory, using a computer or pad, and making one's home cozy and pleasant were statistically significant, but rather marginal overall. These activities are all feasible to do at home independently. In line with these findings, our cross-sectional analyses showed that exercising one's mind or memory was relatively independent of neighborhood mobility. These findings support the idea that pursuing activities in line with one's goals, capacity and opportunities is possible even in the face of mobility restriction regardless of its cause, e.g. related to aging (Siltanen et al., 2019; Tourunen et al., 2020) or external circumstances such as COVID-19. Flexibly adapting one's goals and one's behavior to prevailing circumstances are important skills and should be supported whenever possible (Rantanen, Hassandra et al., 2020). Furthermore, taking an interest in self-care and personal living circumstances is an indicator of general well-being (Lommi et al., 2015). Cognitive engagement in activities such as exercising mind and memory and using a computer or pad may positively contribute to maintain health and cognitive function (Phillips, 2017; von Humboldt et al., 2020).

An earlier study reported that during a period of COVID-19-related protective measures, activities related to maintaining friendships, learning, and even matters of faith could be continued by using digital devices as reported elsewhere (von Humboldt et al., 2020). Research in younger populations showed that the COVID-19 situation and related protective restrictions made people more aware of the importance of maintaining social contacts and helping and supporting others (Sin et al., 2021) and increased efforts to meet others through digital means, including meeting new people and old friends from past times (von Humboldt et al., 2020). In the current study on older adults, activities related to maintaining friendships or making new friends, participating in events to do with learning, and advancing matters of faith or worldview declined over time. The UJACAS items, however, do not account for different ways in which these activities can be practiced (digital vs. in person). From spring 2020, activities were organized remotely and transferred to the internet. However, considering the digital divide in older populations especially, abilities and opportunities to participate in such activities are not equally distributed (Xie et al., 2020). This may explain why in the current cohort a marginal decline rather than an increase in the use of computers and pads was observed. During the period of emergency regulations, some participants may have lost opportunities to ask for assistance from other people, thus reducing their digital activities. Possibly, others able to use these devices independently may have increased their digital activities, enabling participation in meaningful cultural and social activities no longer desirable in real life. Differences in will, ability, and opportunity to use digital devices and the extent of using them at baseline was not necessarily associated with neighborhood mobility, but with other known correlates of digital device proficiency or use, such as age, sex, health, level of education, financial status (Xie et al., 2020), which also have been associated with neighborhood or life-space mobility behavior (Baker et al., 2003). Considering the ongoing COVID-19 situation with persistent protective measures and increasing amounts

of activities offered online, it is crucial to reduce the digital divide to enable all people to use digital devices according to their wishes and thereby help to prevent social isolation (von Humboldt et al., 2020; Xie et al., 2020), especially in restrictive situations like these where physical contact is not desirable.

Before COVID-19, active aging scores were lower for those with limited neighborhood mobility than for those moving in or beyond the neighborhood on a daily basis. This is in line with previously reported cross-sectional associations between active aging scores and life-space mobility (Rantanen et al., 2019). Furthermore, participants with more limited neighborhood mobility had comparatively poorer health and function, as previously reported (Baker et al., 2003; Portegijs, Rantakokko et al., 2014). Those functioning at a level close to their maximum capacity in daily life, likely limit their activity (Schrager et al., 2014), i.e. neighborhood mobility, and adjust their goals accordingly in order to maintain their energy balance (Saajanaho, Viljanen et al., 2016). Ultimately, one may need to select and optimize one's activities, e.g. by adapting the performance (Skantz et al., 2020), and if necessary, by dropping other less crucial activities. Those with more limited resources were expected to experience accelerated declines in ability and activity aspects of active aging in line with earlier studies on life-space mobility (Portegijs et al., 2016; Rantakokko et al., 2017). However, this conception was not supported as group differences were either not found or these indicated that those with limited mobility better preserved their opportunities to act in helping and supporting others, meeting new people, making home more cozy and pleasant, and advancing matters of faith and worldview, and better retained their extent of participating in events to do with studying, clubs and associations, and advancing societal and communal matters, compared to those with daily neighborhood mobility. Possibly, those with limited neighborhood mobility were better accustomed to a situation of limited mobility and already utilized different means of activity engagement (e.g. performance at home rather than out-of-home) or were more agile to adapt their behavior due to better familiarity with their home environment (Cerin et al., 2017). In contrast, those with daily neighborhood mobility likely experienced an unfamiliar situation, radically different from their daily life from before COVID-19. Those spending more time in and around the home may have been less affected in their daily routines by the protective measures, although this is not supported by our data based on their own estimation of perceived restrictions in daily life due to COVID-19 protective measures, which did not differ between the groups.

A major strength of the current study is that it is based on a population with relatively large sample size and a high retention rate throughout the follow-up. As typical in aging research those with slightly better health and function continued in the study, consequently associations reported may likely be underestimations. Active aging from the perspective of the individual is novel, thus this study contributes to the accumulation of new knowledge and further development of the concept. We looked at active aging and individual activities of older people in a comprehensive manner. The fact that all data was based on

self-reports may be perceived as a limitation, however, the main measures used have been thoroughly evaluated and tested for validity and reliability, including in the specific study region.

A clear limitation of the current study is the change in data collection method from baseline (home interview) to follow-up (postal questionnaire). There is no way to ensure that questions were understood by each participant responding to the postal questionnaire or whether answers were provided by the intended participant rather than a spouse or carer. Despite adjusting our analyses, some residual confounding may have remained in the models. While reported changes in UJACAS scores relative to two years prior co-occurred with the COVID-19 restrictions, caution should be taken when drawing causal relations based on this study, as age-related changes occurring over time in active aging scores and items are still unknown. Furthermore, the UJACAS scale may hide subtle changes in activity modes, for example, a change from crafting in a group setting to practicing it independently at home may lead to similar responses on the scale. The study data were collected in one city in the Central Finland region. Further study is warranted to know whether these results are applicable to other settings beyond the region, considering the variability in COVID-19 related governmental restrictions (ECDC, 2020. URL: <https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-rapid-risk-assessment-coronavirus-disease-2019-ninth-update-23-april-2020.pdf>; Geng et al., 2020; Grima et al., 2020) and cultural differences more in general.

## 5. Conclusions

Active aging scores of the individual were generally higher among older adults with greater neighborhood mobility, and declined amid COVID-19 regardless of neighborhood mobility. For individual items changes were less consistent, but largely in line with expected changes related to government implemented protective measures. Typically, activities of those with greater neighborhood mobility were more affected or those with more limited neighborhood mobility were better able to identify opportunities for different activities close to home and thus, maintaining their activity in individual items. These findings support the idea that active aging is possible for individuals by modifying one's personal goals and behavior in accordance with the prevailing circumstances as well as one's own abilities and opportunities. Further research is needed to identify other factors underlying declines in active aging scores in older adults and to distinguish typical age-related changes from COVID-19 related changes. Also it will be interesting to find out, whether the changes reported in the current study are persistent or present a more temporary state with the ongoing COVID-19 situation.

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Author contributions: EP and TR: concept and design of study. EP, MS, HL, JE, and TR: acquisition of data. EP: statistical analyses, interpretation of results, and drafting the manuscript. MS, KK, HL, JE and TR: critically revising the manuscript and substantially contributing to its contents.

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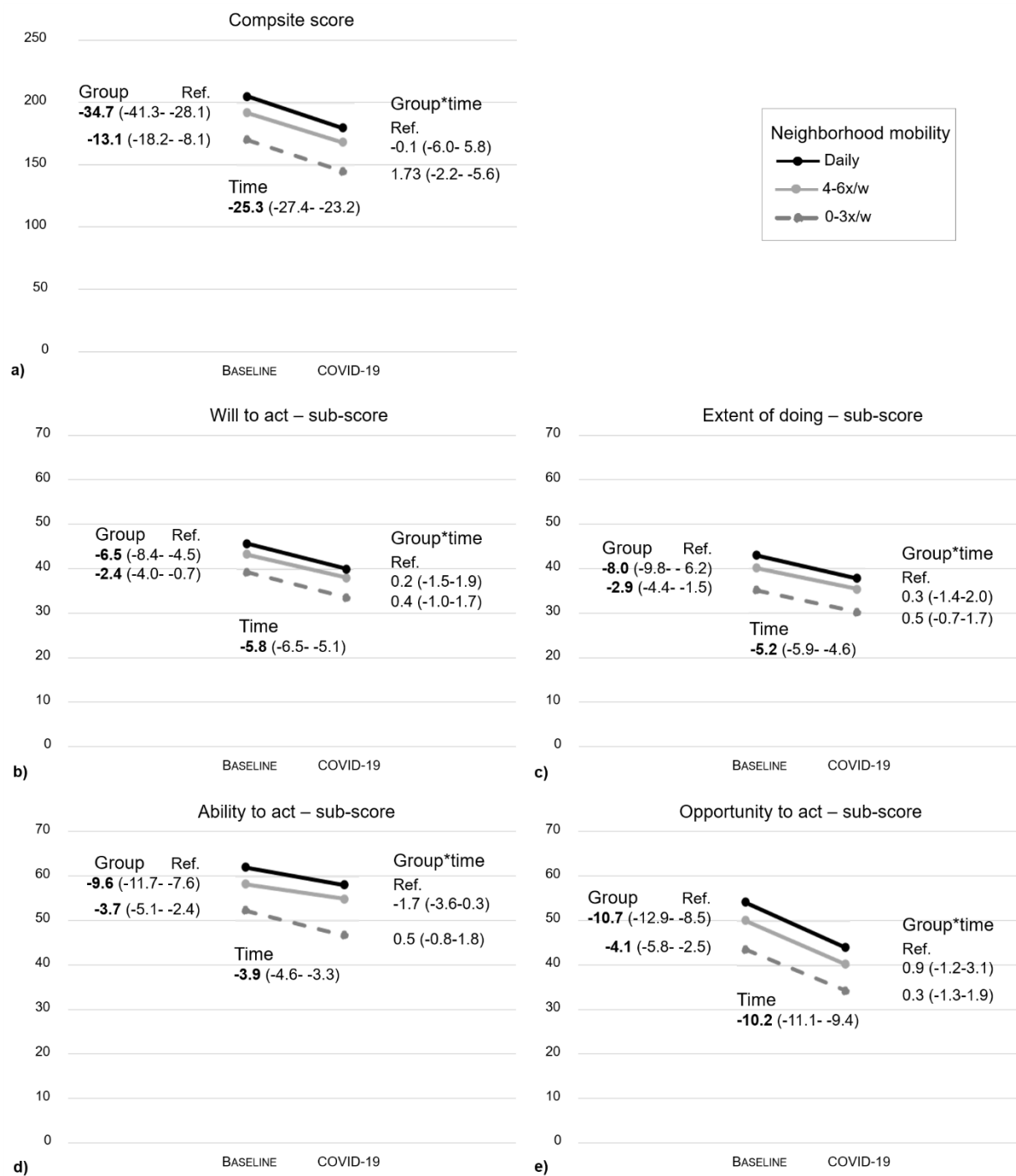
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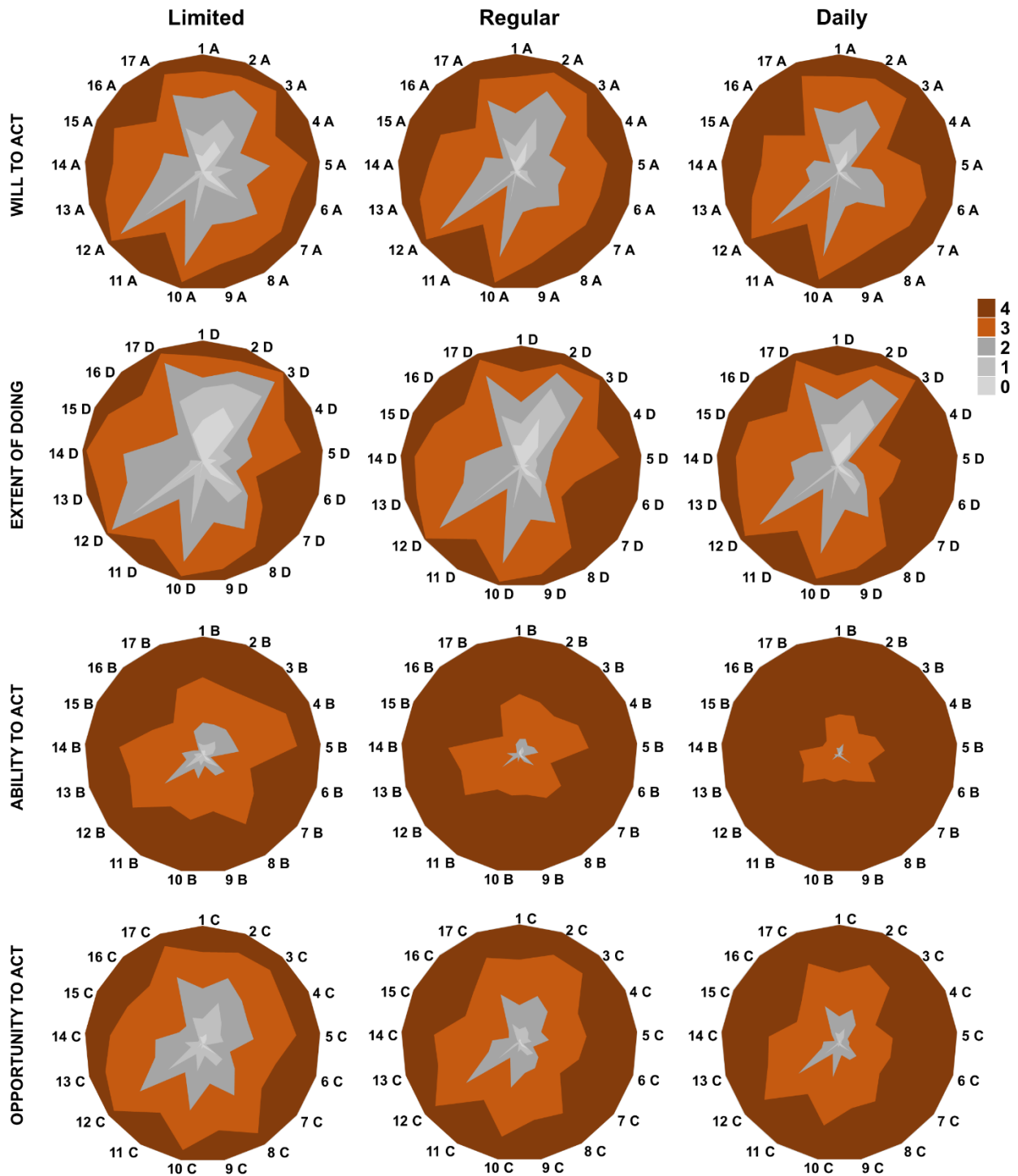
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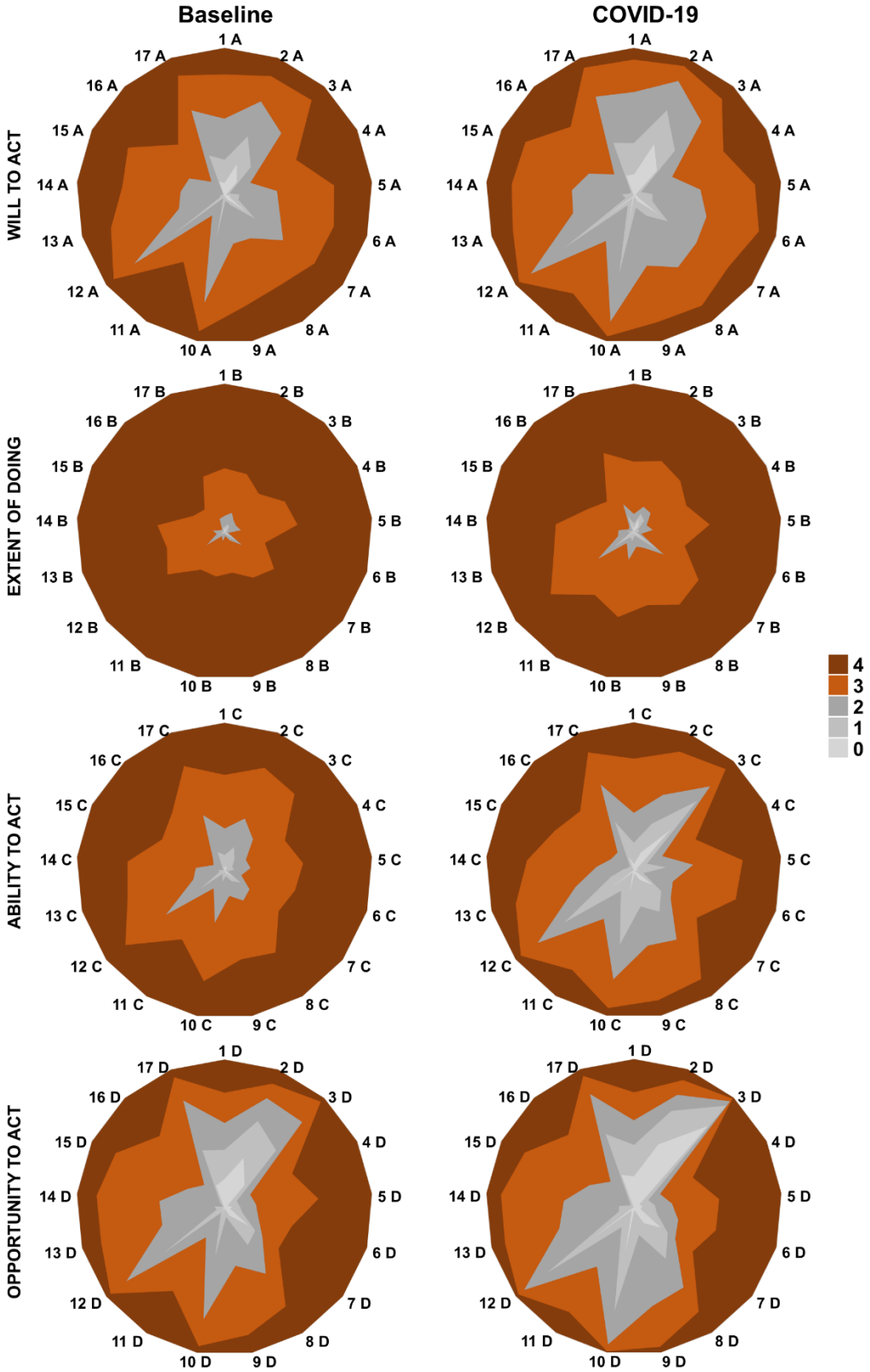
## 8. Tables & Figures



**Figure 1.** Mean UJACAS composite score (a) and will to act (b), extent of doing (c), ability to act (d), and opportunity to act (e) sub-scores at baseline and amid COVID-19 according to baseline level of neighborhood mobility (n=774). Age and sex adjusted generalized estimation equations model results (linear identity link function) presented as B (95% confidence intervals) for group, time and group by time effects with daily neighborhood mobility and / or the baseline assessment as references (Ref.), bolded if  $p < .05$ .



**Figure 2.** Will, ability and opportunity to act, and extent of doing to each UJACAS item at baseline for participants with limited (n=117), regular (n=175) or daily (n=482) neighborhood mobility, respectively. Higher item scores (presented in darker and orange color) indicate higher will, ability and opportunity to act, and extent of doing, respectively.



**Figure 3.** Will, ability and opportunity to act, and extent of doing to each UJACAS item at baseline and amid COVID-19 (n=774). Higher item scores (presented in darker and orange color) indicate higher will, ability and opportunity to act, and extent of doing, respectively.

**Table 1.** Baseline participant characteristics according to neighborhood mobility at baseline for the baseline sample (n=1007) and the subsample included in the prospective analyses (n=774).

	All at BL			P	Subsample at BL			P
	Limited (n=163)	Regular (n=234)	Daily (n=610)		Limited (n=117)	Regular (n=175)	Daily (n=482)	
Age group (% , 75)	32.5	46.6	47.9	<b>&lt;.001</b>	35.0	48.6	51.0	<b>&lt;.001</b>
(% , 80)	28.2	31.2	34.9		29.1	32.0	33.4	
(% , 85)	39.3	22.2	17.2		35.9	19.4	15.6	
Sex (% , Woman)	64.4	64.1	52.8	<b>.002</b>	68.4	67.4	53.5	<b>&lt;.001</b>
Financial situation (% , good-excellent)	53.7	56.2	63.6	<b>.025</b>	56.0	58.0	64.9	.098
Car use (% weekly car driver/passenger)	41.0	49.8	61.7	<b>&lt;.001</b>	41.6	48.6	63.0	<b>&lt;.001</b>
Living situation (% alone)	55.8	39.3	38.0	<b>&lt;.001</b>	53.8	38.3	36.9	<b>.003</b>
Type of housing (% family home)	36.4	42.3	44.1	.213	39.3	39.4	45.6	.234
MMSE (0-30 p, M±SD)	25.9 ± 3.2	27.3 ± 2.3	27.5 ± 2.2	<b>&lt;.001</b>	26.6 ± 2.7	27.6 ± 2.0	27.7 ± 1.9	<b>&lt;.001</b>
SPPB (0-12 p, M±SD)	7.9 ± 3.1	9.8 ± 2.1	10.5 ± 1.8	<b>&lt;.001</b>	8.3 ± 3.0	10.0 ± 2.0	10.7 ± 1.7	<b>&lt;.001</b>
Chronic conditions (n, M±SD)	4.3 ± 2.2	3.8 ± 2.0	3.0 ± 1.9	<b>&lt;.001</b>	4.4 ± 2.1	3.8 ± 1.9	3.0 ± 2.0	<b>&lt;.001</b>
UJACAS composite (0-272, M±SD)	167.8±34.3	189.0±30.9	202.0±27.2	<b>&lt;.001</b>	170.4±34.5	192.0±30.6	205.1±25.5	<b>&lt;.001</b>
UJACAS will to act (0-68, M±SD)	39.2 ±10.1	42.8 ± 9.8	45.1 ± 8.8	<b>&lt;.001</b>	39.3 ± 9.9	43.4 ± 9.9	45.8 ± 8.6	<b>&lt;.001</b>
UJACAS ability to act (0-68, M±SD)	52.1±11.1	57.7 ± 8.4	61.3 ± 6.8	<b>&lt;.001</b>	52.4±10.7	58.3 ± 8.3	62.0 ± 6.3	<b>&lt;.001</b>
UJACAS opportunity to act (0-68, M±SD)	42.6±11.4	49.2±10.2	53.4 ± 9.1	<b>&lt;.001</b>	43.7±11.5	50.2±10.2	54.3 ± 8.5	<b>&lt;.001</b>
UJACAS extent of doing (0-68, M±SD)	33.9 ± 9.3	39.4 ± 8.8	42.3 ± 8.0	<b>&lt;.001</b>	35.1 ± 9.1	40.1 ± 8.8	43.0 ± 7.7	<b>&lt;.001</b>

Note: Statistically significant P-values are bolded. M=Mean, SD= standard deviation. Bold values indicate p<.050.

**Table 2.** Prospective GEE models displaying associations between baseline neighborhood mobility and UJACAS item scores (group) from the will and opportunity to act and extent of doing perspectives and their change over time overall (time) and in the groups (interaction) (n=774).

Item	Time			Group						Interaction							
	B	(95%CI)		Limited		Regular		Daily	B	Limited		Regular		Daily			
				B	(95%CI)	B	(95%CI)	B	(95%CI)	B	B	(95%CI)	B	(95%CI)	B		
<b>Will to act</b>																	
1 (crafting & DIY)	<b>-0.41</b>	<b>-0.51</b>	<b>-0.31</b>	<b>-0.29</b>	<b>-0.54</b>	<b>-0.04</b>	0.02	-0.18	0.23	ref.	-0.07	-0.29	0.15	-0.15	-0.34	0.04	ref.
2 (musical & artistic pursuits)	<b>-0.59</b>	<b>-0.71</b>	<b>-0.47</b>	-0.27	-0.54	0.00	<b>-0.30</b>	<b>-0.53</b>	<b>-0.07</b>	ref.	0.10	-0.16	0.37	0.07	-0.16	0.29	ref.
3 (participating in events)	<b>-0.43</b>	<b>-0.54</b>	<b>-0.31</b>	<b>-0.56</b>	<b>-0.81</b>	<b>-0.31</b>	<b>-0.22</b>	<b>-0.42</b>	<b>-0.03</b>	ref.	0.07	-0.16	0.31	0.17	-0.06	0.41	ref.
4 (enjoying outdoor nature)	<b>-0.27</b>	<b>-0.34</b>	<b>-0.20</b>	<b>-0.60</b>	<b>-0.80</b>	<b>-0.40</b>	<b>-0.48</b>	<b>-0.64</b>	<b>-0.33</b>	ref.	-0.10	-0.32	0.11	<b>0.18</b>	<b>0.01</b>	<b>0.35</b>	ref.
5 (to keep physically fit)	<b>-0.23</b>	<b>-0.32</b>	<b>-0.15</b>	<b>-0.76</b>	<b>-0.98</b>	<b>-0.54</b>	<b>-0.30</b>	<b>-0.48</b>	<b>-0.13</b>	ref.	0.07	-0.15	0.29	<b>0.16</b>	<b>0.01</b>	<b>0.32</b>	ref.
6 (exercising mind & memory)	<b>-0.28</b>	<b>-0.37</b>	<b>-0.19</b>	-0.12	-0.34	0.10	0.01	-0.16	0.19	ref.	-0.02	-0.24	0.20	0.10	-0.08	0.28	ref.
7 (computer & pad use)	<b>-0.13</b>	<b>-0.21</b>	<b>-0.05</b>	<b>-0.46</b>	<b>-0.75</b>	<b>-0.17</b>	0.04	-0.19	0.28	ref.	-0.09	-0.28	0.09	0.01	-0.16	0.18	ref.
8 (helping & supporting others)	<b>-0.50</b>	<b>-0.60</b>	<b>-0.41</b>	<b>-0.48</b>	<b>-0.70</b>	<b>-0.26</b>	-0.08	-0.24	0.09	ref.	0.14	-0.09	0.38	-0.06	-0.25	0.12	ref.
9 (maintaining friendships)	<b>-0.31</b>	<b>-0.39</b>	<b>-0.23</b>	<b>-0.31</b>	<b>-0.49</b>	<b>-0.12</b>	-0.10	-0.24	0.04	ref.	-0.04	-0.25	0.16	0.02	-0.14	0.17	ref.
10 (meeting new people)	<b>-0.55</b>	<b>-0.65</b>	<b>-0.44</b>	<b>-0.36</b>	<b>-0.57</b>	<b>-0.15</b>	-0.05	-0.21	0.11	ref.	0.20	-0.03	0.43	-0.15	-0.34	0.04	ref.
11 (life matters)	<b>-0.49</b>	<b>-0.58</b>	<b>-0.40</b>	<b>-0.26</b>	<b>-0.43</b>	<b>-0.08</b>	0.00	-0.13	0.13	ref.	-0.07	-0.30	0.16	-0.09	-0.27	0.08	ref.
12 (societal & communal matters)	<b>-0.43</b>	<b>-0.53</b>	<b>-0.32</b>	<b>-0.55</b>	<b>-0.77</b>	<b>-0.33</b>	<b>-0.22</b>	<b>-0.41</b>	<b>-0.03</b>	ref.	0.16	-0.06	0.38	0.08	-0.12	0.28	ref.
13 (interesting days)	<b>-0.20</b>	<b>-0.27</b>	<b>-0.12</b>	<b>-0.36</b>	<b>-0.52</b>	<b>-0.19</b>	<b>-0.24</b>	<b>-0.38</b>	<b>-0.11</b>	ref.	-0.01	-0.19	0.17	0.05	-0.11	0.20	ref.
14 (cozy & pleasant home)	<b>-0.29</b>	<b>-0.37</b>	<b>-0.20</b>	<b>-0.24</b>	<b>-0.42</b>	<b>-0.06</b>	-0.12	-0.26	0.03	ref.	-0.14	-0.34	0.06	-0.01	-0.18	0.15	ref.
15 (personal appearance)	<b>-0.18</b>	<b>-0.25</b>	<b>-0.11</b>	<b>-0.28</b>	<b>-0.43</b>	<b>-0.12</b>	-0.06	-0.20	0.08	ref.	0.00	-0.17	0.18	-0.01	-0.16	0.13	ref.
16 (personal finances)	<b>-0.22</b>	<b>-0.30</b>	<b>-0.15</b>	<b>-0.22</b>	<b>-0.38</b>	<b>-0.06</b>	-0.11	-0.24	0.02	ref.	-0.12	-0.31	0.08	0.00	-0.15	0.15	ref.
17 (faith & worldview matters)	<b>-0.31</b>	<b>-0.42</b>	<b>-0.21</b>	<b>-0.36</b>	<b>-0.61</b>	<b>-0.12</b>	-0.14	-0.35	0.06	ref.	0.13	-0.12	0.37	0.01	-0.18	0.21	ref.
<b>Opportunity to act</b>																	
1 (crafting & DIY)	<b>-0.26</b>	<b>-0.36</b>	<b>-0.16</b>	<b>-0.61</b>	<b>-0.84</b>	<b>-0.38</b>	<b>-0.26</b>	<b>-0.44</b>	<b>-0.08</b>	ref.	<b>-0.26</b>	<b>-0.51</b>	<b>-0.01</b>	-0.04	-0.25	0.16	ref.
2 (musical & artistic pursuits)	<b>-0.57</b>	<b>-0.69</b>	<b>-0.45</b>	<b>-0.73</b>	<b>-0.97</b>	<b>-0.48</b>	<b>-0.23</b>	<b>-0.41</b>	<b>-0.05</b>	ref.	0.05	-0.24	0.33	0.08	-0.15	0.30	ref.
3 (participating in events)	<b>-1.66</b>	<b>-1.80</b>	<b>-1.52</b>	<b>-0.72</b>	<b>-0.93</b>	<b>-0.50</b>	<b>-0.37</b>	<b>-0.53</b>	<b>-0.20</b>	ref.	0.17	-0.13	0.46	0.14	-0.12	0.41	ref.
4 (enjoying outdoor nature)	<b>-0.09</b>	<b>-0.16</b>	<b>-0.01</b>	<b>-0.95</b>	<b>-1.15</b>	<b>-0.75</b>	<b>-0.41</b>	<b>-0.56</b>	<b>-0.25</b>	ref.	-0.22	-0.45	0.01	-0.03	-0.19	0.14	ref.
5 (to keep physically fit)	<b>-0.60</b>	<b>-0.70</b>	<b>-0.50</b>	<b>-0.87</b>	<b>-1.07</b>	<b>-0.67</b>	<b>-0.38</b>	<b>-0.54</b>	<b>-0.21</b>	ref.	0.00	-0.25	0.25	-0.09	-0.30	0.12	ref.
6 (exercising mind & memory)	<b>-0.44</b>	<b>-0.52</b>	<b>-0.35</b>	<b>-0.36</b>	<b>-0.53</b>	<b>-0.20</b>	<b>-0.14</b>	<b>-0.28</b>	<b>0.00</b>	ref.	-0.09	-0.29	0.11	0.06	-0.10	0.23	ref.
7 (computer & pad use)	<b>-0.35</b>	<b>-0.44</b>	<b>-0.26</b>	<b>-0.55</b>	<b>-0.83</b>	<b>-0.27</b>	-0.09	-0.31	0.13	ref.	-0.15	-0.39	0.09	0.07	-0.11	0.25	ref.
8 (helping & supporting others)	<b>-0.87</b>	<b>-0.99</b>	<b>-0.76</b>	<b>-0.87</b>	<b>-1.07</b>	<b>-0.67</b>	<b>-0.32</b>	<b>-0.49</b>	<b>-0.14</b>	ref.	<b>0.33</b>	<b>0.08</b>	<b>0.59</b>	0.01	-0.22	0.23	ref.
9 (maintaining friendships)	<b>-0.88</b>	<b>-0.98</b>	<b>-0.78</b>	<b>-0.53</b>	<b>-0.72</b>	<b>-0.34</b>	<b>-0.30</b>	<b>-0.44</b>	<b>-0.16</b>	ref.	0.15	-0.10	0.39	0.03	-0.17	0.22	ref.
10 (meeting new people)	<b>-1.21</b>	<b>-1.32</b>	<b>-1.10</b>	<b>-0.73</b>	<b>-0.92</b>	<b>-0.53</b>	<b>-0.24</b>	<b>-0.39</b>	<b>-0.08</b>	ref.	<b>0.28</b>	<b>0.03</b>	<b>0.53</b>	0.05	-0.18	0.28	ref.
11 (life matters)	<b>-0.62</b>	<b>-0.72</b>	<b>-0.52</b>	<b>-0.44</b>	<b>-0.62</b>	<b>-0.25</b>	-0.10	-0.23	0.03	ref.	0.00	-0.23	0.24	-0.10	-0.29	0.10	ref.



12 (societal & communal matters)	<b>-1.03</b>	<b>-1.14</b>	<b>-0.91</b>	<b>-0.62</b>	<b>-0.83</b>	<b>-0.42</b>	<b>-0.30</b>	<b>-0.48</b>	<b>-0.13</b>	ref.	0.15	-0.11	0.42	0.03	-0.18	0.24	ref.
13 (interesting days)	<b>-0.50</b>	<b>-0.59</b>	<b>-0.41</b>	<b>-0.59</b>	<b>-0.77</b>	<b>-0.42</b>	<b>-0.23</b>	<b>-0.37</b>	<b>-0.09</b>	ref.	<b>0.20</b>	<b>0.00</b>	<b>0.40</b>	0.00	-0.17	0.17	ref.
14 (cozy & pleasant home)	<b>-0.13</b>	<b>-0.21</b>	<b>-0.05</b>	<b>-0.61</b>	<b>-0.81</b>	<b>-0.41</b>	<b>-0.22</b>	<b>-0.35</b>	<b>-0.09</b>	ref.	-0.02	-0.23	0.20	-0.09	-0.25	0.06	ref.
15 (personal appearance)	<b>-0.28</b>	<b>-0.35</b>	<b>-0.20</b>	<b>-0.53</b>	<b>-0.68</b>	<b>-0.37</b>	<b>-0.17</b>	<b>-0.28</b>	<b>-0.05</b>	ref.	0.09	-0.12	0.30	0.08	-0.08	0.23	ref.
16 (personal finances)	-0.07	-0.15	0.01	<b>-0.33</b>	<b>-0.49</b>	<b>-0.17</b>	<b>-0.15</b>	<b>-0.28</b>	<b>-0.02</b>	ref.	-0.06	-0.26	0.14	0.00	-0.15	0.14	ref.
17 (faith & worldview matters)	<b>-0.69</b>	<b>-0.81</b>	<b>-0.58</b>	<b>-0.63</b>	<b>-0.85</b>	<b>-0.42</b>	<b>-0.23</b>	<b>-0.41</b>	<b>-0.05</b>	ref.	<b>0.32</b>	<b>0.02</b>	<b>0.62</b>	0.11	-0.10	0.33	ref.
<b>Extent of doing</b>																	
1 (crafting & DIY)	-0.07	-0.19	0.05	<b>-0.69</b>	<b>-0.98</b>	<b>-0.40</b>	-0.02	-0.26	0.22	ref.	0.18	-0.11	0.47	-0.13	-0.35	0.09	ref.
2 (musical & artistic pursuits)	<b>-0.26</b>	<b>-0.39</b>	<b>-0.14</b>	<b>-0.29</b>	<b>-0.56</b>	<b>-0.01</b>	<b>-0.28</b>	<b>-0.50</b>	<b>-0.05</b>	ref.	0.10	-0.18	0.38	0.17	-0.06	0.40	ref.
3 (participating in events)	<b>-1.24</b>	<b>-1.36</b>	<b>-1.13</b>	<b>-0.64</b>	<b>-0.85</b>	<b>-0.44</b>	-0.14	-0.34	0.05	ref.	<b>0.46</b>	<b>0.22</b>	<b>0.70</b>	0.07	-0.14	0.29	ref.
4 (enjoying outdoor nature)	0.04	-0.05	0.13	<b>-0.85</b>	<b>-1.08</b>	<b>-0.63</b>	<b>-0.63</b>	<b>-0.81</b>	<b>-0.45</b>	ref.	<b>-0.37</b>	<b>-0.62</b>	<b>-0.11</b>	<b>0.20</b>	<b>0.01</b>	<b>0.39</b>	ref.
5 (to keep physically fit)	-0.05	-0.15	0.05	<b>-0.82</b>	<b>-1.06</b>	<b>-0.58</b>	<b>-0.50</b>	<b>-0.68</b>	<b>-0.33</b>	ref.	-0.12	-0.42	0.18	0.14	-0.06	0.35	ref.
6 (exercising mind & memory)	<b>-0.23</b>	<b>-0.34</b>	<b>-0.12</b>	-0.10	-0.35	0.15	0.00	-0.19	0.20	ref.	-0.16	-0.46	0.14	0.15	-0.06	0.36	ref.
7 (computer & pad use)	<b>-0.09</b>	<b>-0.16</b>	<b>-0.02</b>	<b>-0.66</b>	<b>-1.01</b>	<b>-0.32</b>	0.11	-0.16	0.38	ref.	-0.07	-0.26	0.11	-0.09	-0.25	0.07	ref.
8 (helping & supporting others)	<b>-0.30</b>	<b>-0.44</b>	<b>-0.17</b>	<b>-0.42</b>	<b>-0.68</b>	<b>-0.17</b>	-0.14	-0.35	0.08	ref.	-0.06	-0.33	0.20	-0.04	-0.28	0.21	ref.
9 (maintaining friendships)	<b>-0.48</b>	<b>-0.56</b>	<b>-0.40</b>	<b>-0.31</b>	<b>-0.49</b>	<b>-0.14</b>	<b>-0.17</b>	<b>-0.31</b>	<b>-0.03</b>	ref.	-0.11	-0.33	0.11	-0.02	-0.18	0.13	ref.
10 (meeting new people)	<b>-0.84</b>	<b>-0.93</b>	<b>-0.74</b>	<b>-0.48</b>	<b>-0.68</b>	<b>-0.28</b>	<b>-0.19</b>	<b>-0.35</b>	<b>-0.03</b>	ref.	0.12	-0.12	0.36	-0.04	-0.23	0.14	ref.
11 (life matters)	<b>-0.53</b>	<b>-0.63</b>	<b>-0.42</b>	<b>-0.38</b>	<b>-0.57</b>	<b>-0.19</b>	-0.07	-0.21	0.06	ref.	-0.03	-0.27	0.20	-0.04	-0.23	0.15	ref.
12 (societal & communal matters)	<b>-0.52</b>	<b>-0.63</b>	<b>-0.41</b>	<b>-0.61</b>	<b>-0.81</b>	<b>-0.41</b>	-0.18	-0.36	0.00	ref.	<b>0.26</b>	<b>0.05</b>	<b>0.47</b>	-0.04	-0.23	0.16	ref.
13 (interesting days)	<b>-0.17</b>	<b>-0.25</b>	<b>-0.08</b>	<b>-0.42</b>	<b>-0.59</b>	<b>-0.25</b>	<b>-0.18</b>	<b>-0.31</b>	<b>-0.05</b>	ref.	0.03	-0.16	0.22	-0.05	-0.19	0.09	ref.
14 (cozy & pleasant home)	<b>-0.11</b>	<b>-0.19</b>	<b>-0.03</b>	<b>-0.45</b>	<b>-0.60</b>	<b>-0.31</b>	<b>-0.15</b>	<b>-0.29</b>	<b>-0.01</b>	ref.	0.05	-0.13	0.23	-0.03	-0.20	0.13	ref.
15 (personal appearance)	-0.05	-0.13	0.02	<b>-0.16</b>	<b>-0.30</b>	<b>-0.03</b>	-0.03	-0.15	0.10	ref.	-0.06	-0.23	0.12	-0.05	-0.19	0.09	ref.
16 (personal finances)	-0.06	-0.15	0.03	<b>-0.27</b>	<b>-0.44</b>	<b>-0.09</b>	-0.14	-0.28	0.01	ref.	-0.03	-0.25	0.19	0.10	-0.06	0.27	ref.
17 (faith & worldview matters)	<b>-0.29</b>	<b>-0.40</b>	<b>-0.19</b>	<b>-0.42</b>	<b>-0.63</b>	<b>-0.20</b>	<b>-0.21</b>	<b>-0.40</b>	<b>-0.02</b>	ref.	0.16	-0.08	0.40	0.11	-0.09	0.30	ref.

Note: Age and sex adjusted regression coefficients (B) and 95% confidence intervals (95%CI) derived from GEE models with identity link function, bolded if p<.05.

**Table 3.** Prospective GEE models displaying associations between baseline neighborhood mobility and high UJACAS item scores (group) from the ability perspective and its change over time overall (time) and in the groups (interaction) (n=774).

Item	Time			Group						Interaction							
	OR	(95%CI)		Limited	(95%CI)		Regular	(95%CI)		Daily	OR	(95%CI)		Regular	(95%CI)		Daily
<b>Ability to act</b>																	
1 (crafting & DIY)	0.82	0.65	1.02	<b>0.27</b>	<b>0.18</b>	<b>0.41</b>	<b>0.50</b>	<b>0.35</b>	<b>0.71</b>	ref.	1.00	0.63	1.61	1.01	0.67	1.53	ref.
2 (musical & artistic pursuits)	<b>0.72</b>	<b>0.57</b>	<b>0.90</b>	<b>0.36</b>	<b>0.24</b>	<b>0.55</b>	<b>0.60</b>	<b>0.42</b>	<b>0.85</b>	ref.	0.80	0.48	1.35	0.84	0.55	1.29	ref.
3 (participating in events)	<b>0.55</b>	<b>0.43</b>	<b>0.71</b>	<b>0.19</b>	<b>0.12</b>	<b>0.29</b>	<b>0.41</b>	<b>0.29</b>	<b>0.59</b>	ref.	1.04	0.60	1.79	1.18	0.80	1.75	ref.
4 (enjoying outdoor nature)	<b>1.27</b>	<b>1.04</b>	<b>1.54</b>	<b>0.14</b>	<b>0.09</b>	<b>0.23</b>	<b>0.41</b>	<b>0.29</b>	<b>0.59</b>	ref.	0.96	0.56	1.64	1.19	0.83	1.71	ref.
5 (to keep physically fit)	0.92	0.76	1.12	<b>0.16</b>	<b>0.10</b>	<b>0.25</b>	<b>0.45</b>	<b>0.31</b>	<b>0.63</b>	ref.	1.03	0.59	1.79	0.95	0.65	1.39	ref.
6 (exercising mind & memory)	<b>0.75</b>	<b>0.59</b>	<b>0.96</b>	<b>0.48</b>	<b>0.31</b>	<b>0.73</b>	0.91	0.61	1.34	ref.	0.89	0.54	1.46	0.88	0.57	1.37	ref.
7 (computer & pad use)	<b>0.59</b>	<b>0.48</b>	<b>0.72</b>	<b>0.52</b>	<b>0.35</b>	<b>0.79</b>	0.79	0.55	1.12	ref.	0.94	0.58	1.53	1.12	0.76	1.64	ref.
8 (helping & supporting others)	<b>0.32</b>	<b>0.25</b>	<b>0.41</b>	<b>0.16</b>	<b>0.10</b>	<b>0.25</b>	<b>0.47</b>	<b>0.33</b>	<b>0.68</b>	ref.	<b>2.46</b>	<b>1.44</b>	<b>4.20</b>	1.39	0.91	2.12	ref.
9 (maintaining friendships)	<b>0.31</b>	<b>0.24</b>	<b>0.41</b>	<b>0.28</b>	<b>0.19</b>	<b>0.43</b>	<b>0.50</b>	<b>0.34</b>	<b>0.73</b>	ref.	1.60	0.94	2.73	1.47	0.92	2.35	ref.
10 (meeting new people)	<b>0.27</b>	<b>0.22</b>	<b>0.35</b>	<b>0.24</b>	<b>0.16</b>	<b>0.37</b>	<b>0.56</b>	<b>0.38</b>	<b>0.81</b>	ref.	1.34	0.78	2.30	1.12	0.72	1.76	ref.
11 (life matters)	<b>0.40</b>	<b>0.31</b>	<b>0.51</b>	<b>0.29</b>	<b>0.19</b>	<b>0.45</b>	<b>0.58</b>	<b>0.40</b>	<b>0.84</b>	ref.	0.97	0.57	1.64	1.14	0.73	1.79	ref.
12 (societal & communal matters)	<b>0.34</b>	<b>0.27</b>	<b>0.43</b>	<b>0.22</b>	<b>0.14</b>	<b>0.35</b>	<b>0.47</b>	<b>0.33</b>	<b>0.67</b>	ref.	1.33	0.71	2.48	1.22	0.78	1.88	ref.
13 (interesting days)	<b>0.46</b>	<b>0.37</b>	<b>0.58</b>	<b>0.25</b>	<b>0.16</b>	<b>0.38</b>	<b>0.43</b>	<b>0.30</b>	<b>0.61</b>	ref.	1.34	0.80	2.23	1.25	0.84	1.86	ref.
14 (cozy & pleasant home)	<b>0.64</b>	<b>0.51</b>	<b>0.80</b>	<b>0.21</b>	<b>0.14</b>	<b>0.33</b>	<b>0.34</b>	<b>0.24</b>	<b>0.49</b>	ref.	1.10	0.66	1.84	<b>1.58</b>	<b>1.06</b>	<b>2.36</b>	ref.
15 (personal appearance)	<b>0.49</b>	<b>0.37</b>	<b>0.66</b>	<b>0.21</b>	<b>0.14</b>	<b>0.33</b>	<b>0.46</b>	<b>0.31</b>	<b>0.69</b>	ref.	1.23	0.75	2.02	1.47	0.94	2.32	ref.
16 (personal finances)	<b>0.65</b>	<b>0.49</b>	<b>0.86</b>	<b>0.32</b>	<b>0.21</b>	<b>0.51</b>	0.73	0.47	1.13	ref.	1.20	0.73	1.95	0.89	0.55	1.42	ref.
17 (faith & worldview matters)	<b>0.43</b>	<b>0.34</b>	<b>0.54</b>	<b>0.33</b>	<b>0.22</b>	<b>0.51</b>	<b>0.62</b>	<b>0.43</b>	<b>0.88</b>	ref.	1.37	0.83	2.25	1.43	0.95	2.15	ref.

Note: Age and sex adjusted odds ratios (OR) and 95%CI derived from GEE models with logistic link function, bolded if p<.05. High score= response category 4.

## Supplementary Tables

**Table A.1.** Cross-sectional associations between neighborhood mobility and active aging scores at baseline (n=1007).

UJACAS score	Neighborhood mobility	Score	Sex & age adjusted		+ health & function		+ personal & environmental resources	
		Mean ± SD	B	95%CI	B	95%CI	B	95%CI
<b>Composite</b>			9649.7 <sup>a</sup>		9328.8 <sup>a</sup>		9075.2 <sup>a</sup>	
	Limited	167.8 ± 34.3	-31.1	-36.1- -26.0	-16.2	-21.1- -11.2	-15.7	-20.6- -10.8
	Regular	189.0 ± 30.9	-12.7	-17.1- -8.4	-8.9	-12.8- -4.9	-8.4	-12.3- -4.5
	Daily	202.0 ± 27.2	0.0	ref.	0.0	ref.	0.0	ref.
<b>Will to act</b>			7363.2 <sup>a</sup>		7229.6 <sup>a</sup>		7053.6 <sup>a</sup>	
	Limited	39.2 ± 10.1	-5.6	-7.2- -3.9	-3.0	-4.8- -1.3	-3.1	-4.8- -1.4
	Regular	42.8 ± 9.8	-2.5	-3.9- -1.1	-2.0	-3.4- -0.6	-2.0	-3.4- -0.6
	Daily	45.1 ± 8.8	0.0	ref.	0.0	ref.	0.0	ref.
<b>Ability to act</b>			7031.8 <sup>a</sup>		6685.8 <sup>a</sup>		6499.6 <sup>a</sup>	
	Limited	52.1 ± 11.1	-8.1	-9.5- -6.8	-3.7	-5.0- -2.4	-3.4	-4.7- -2.1
	Regular	57.7 ± 8.4	-3.3	-4.5- -2.1	-1.9	-3.0- -0.9	-1.7	-2.8- -0.7
	Daily	61.3 ± 6.8	0.0	ref.	0.0	ref.	0.0	ref.
<b>Opportunity to act</b>			7424.0 <sup>a</sup>		7136.0 <sup>a</sup>		6928.1 <sup>a</sup>	
	Limited	42.6 ± 11.4	-9.5	-11.1- -7.8	-4.5	-6.2- -2.9	-4.3	-5.9- -2.7
	Regular	49.2 ± 10.2	-4.0	-5.4- -2.6	-2.6	-3.0- -1.3	-2.4	-3.7- -1.1
	Daily	53.4 ± 9.1	0.0	ref.	0.0	ref.	0.0	ref.
<b>Extent of doing</b>			7169.1 <sup>a</sup>		6996.2 <sup>a</sup>		6826.8 <sup>a</sup>	
	Limited	33.9 ± 9.3	-7.9	-9.4- -6.4	-4.9	-6.4- -3.4	-4.9	-6.5- -3.4
	Regular	39.4 ± 8.8	-3.0	-4.2- -1.7	-2.3	-3.5- -1.1	-2.3	-3.5- -1.1
	Daily	42.3 ± 8.0	0.0	ref.	0.0	ref.	0.0	ref.

Note: Generalized linear models with Identity link function. <sup>a</sup> Bayesian Information Criterion estimating Goodness of Fit, smaller scores are better.

**Table A.2.** Linear GLM on baseline UJACAS will to act items in groups based on baseline neighborhood mobility (n=1007).

Item	Neighborhood mobility	Score		Age & sex adjusted			+ health & function			+ personal & environmental resources		
		Mean	± SD	B	(95%CI)		B	(95%CI)		B	(95%CI)	
1 (crafting & DIY)	Limited	2.1	1.2	-0.12	-0.33	0.10	0.00	-0.23	0.23	0.03	-0.21	0.26
	Regular	2.3	1.2	0.08	-0.10	0.26	0.08	-0.10	0.27	0.07	-0.11	0.26
	Daily	2.3	1.2	0.0	ref		0.0	ref		0.0	ref	
2 (musical & artistic pursuits)	Limited	1.6	1.4	-0.23	-0.47	0.01	-0.10	-0.35	0.16	-0.13	-0.39	0.14
	Regular	1.5	1.3	<b>-0.30</b>	<b>-0.51</b>	<b>-0.10</b>	<b>-0.27</b>	<b>-0.48</b>	<b>-0.06</b>	<b>-0.27</b>	<b>-0.48</b>	<b>-0.06</b>
	Daily	1.8	1.3	0.0	ref		0.0	ref		0.0	ref	
3 (participating in events)	Limited	1.7	1.2	<b>-0.53</b>	<b>-0.73</b>	<b>-0.32</b>	<b>-0.32</b>	<b>-0.55</b>	<b>-0.10</b>	<b>-0.36</b>	<b>-0.58</b>	<b>-0.13</b>
	Regular	2.0	1.2	<b>-0.31</b>	<b>-0.49</b>	<b>-0.14</b>	<b>-0.26</b>	<b>-0.44</b>	<b>-0.08</b>	<b>-0.27</b>	<b>-0.45</b>	<b>-0.09</b>
	Daily	2.2	1.2	0.0	ref		0.0	ref		0.0	ref	
4 (enjoying outdoor nature)	Limited	2.8	1.0	<b>-0.56</b>	<b>-0.71</b>	<b>-0.41</b>	<b>-0.43</b>	<b>-0.59</b>	<b>-0.27</b>	<b>-0.43</b>	<b>-0.59</b>	<b>-0.26</b>
	Regular	2.9	0.9	<b>-0.48</b>	<b>-0.61</b>	<b>-0.35</b>	<b>-0.45</b>	<b>-0.58</b>	<b>-0.32</b>	<b>-0.46</b>	<b>-0.59</b>	<b>-0.33</b>
	Daily	3.4	0.7	0.0	ref		0.0	ref		0.0	ref	
5 (to keep physically fit)	Limited	2.2	1.1	<b>-0.68</b>	<b>-0.85</b>	<b>-0.50</b>	<b>-0.45</b>	<b>-0.63</b>	<b>-0.26</b>	<b>-0.45</b>	<b>-0.64</b>	<b>-0.26</b>
	Regular	2.6	1.0	<b>-0.29</b>	<b>-0.44</b>	<b>-0.14</b>	<b>-0.21</b>	<b>-0.37</b>	<b>-0.06</b>	<b>-0.19</b>	<b>-0.34</b>	<b>-0.04</b>
	Daily	2.9	1.0	0.0	ref		0.0	ref		0.0	ref	
6 (exercising mind & memory)	Limited	2.6	1.2	-0.16	-0.34	0.02	-0.07	-0.27	0.12	-0.05	-0.25	0.15
	Regular	2.7	1.1	-0.06	-0.22	0.09	-0.06	-0.22	0.09	-0.05	-0.20	0.11
	Daily	2.7	1.0	0.0	ref		0.0	ref		0.0	ref	
7 (computer & pad use)	Limited	1.8	1.5	-0.22	-0.46	0.02	0.14	-0.11	0.39	0.13	-0.13	0.38
	Regular	2.3	1.4	0.11	-0.09	0.32	0.18	-0.03	0.38	0.18	-0.02	0.37
	Daily	2.3	1.4	0.0	ref		0.0	ref		0.0	ref	
8 (helping & supporting others)	Limited	2.5	1.1	<b>-0.38</b>	<b>-0.55</b>	<b>-0.21</b>	<b>-0.22</b>	<b>-0.41</b>	<b>-0.03</b>	<b>-0.20</b>	<b>-0.38</b>	<b>-0.01</b>
	Regular	2.8	1.0	-0.10	-0.24	0.05	-0.07	-0.22	0.08	-0.07	-0.22	0.08
	Daily	2.9	0.9	0.0	ref		0.0	ref		0.0	ref	
9 (maintaining friendships)	Limited	2.6	1.0	<b>-0.34</b>	<b>-0.48</b>	<b>-0.19</b>	<b>-0.24</b>	<b>-0.39</b>	<b>-0.08</b>	<b>-0.21</b>	<b>-0.37</b>	<b>-0.05</b>
	Regular	2.8	0.8	-0.12	-0.25	0.00	-0.09	-0.22	0.03	-0.09	-0.22	0.04
	Daily	2.9	0.8	0.0	ref		0.0	ref		0.0	ref	
10 (meeting new people)	Limited	1.7	1.1	<b>-0.30</b>	<b>-0.47</b>	<b>-0.13</b>	<b>-0.22</b>	<b>-0.40</b>	<b>-0.03</b>	<b>-0.27</b>	<b>-0.45</b>	<b>-0.08</b>
	Regular	2.0	0.9	-0.07	-0.21	0.08	-0.06	-0.21	0.09	-0.07	-0.22	0.08
	Daily	2.0	1.0	0.0	ref		0.0	ref		0.0	ref	
11 (life matters)	Limited	3.1	0.9	<b>-0.23</b>	<b>-0.37</b>	<b>-0.09</b>	-0.09	-0.24	0.07	-0.07	-0.22	0.08
	Regular	3.3	0.8	-0.06	-0.18	0.06	-0.05	-0.17	0.07	-0.03	-0.15	0.09
	Daily	3.3	0.8	0.0	ref		0.0	ref		0.0	ref	
12 (societal & communal matters)	Limited	1.3	1.1	<b>-0.39</b>	<b>-0.58</b>	<b>-0.20</b>	-0.18	-0.39	0.03	-0.21	-0.42	0.00
	Regular	1.6	1.1	-0.16	-0.33	0.00	-0.13	-0.30	0.04	-0.13	-0.30	0.03

	Daily	1.8	1.1	0.0	ref		0.0	ref		0.0	ref	
13 (interesting days)	Limited	2.6	0.9	<b>-0.36</b>	<b>-0.50</b>	<b>-0.22</b>	<b>-0.25</b>	<b>-0.40</b>	<b>-0.10</b>	<b>-0.26</b>	<b>-0.41</b>	<b>-0.10</b>
	Regular	2.7	0.8	<b>-0.24</b>	<b>-0.36</b>	<b>-0.12</b>	<b>-0.21</b>	<b>-0.34</b>	<b>-0.09</b>	<b>-0.20</b>	<b>-0.32</b>	<b>-0.08</b>
	Daily	2.9	0.8	0.0	ref		0.0	ref		0.0	ref	
14 (cozy & pleasant home)	Limited	2.8	0.9	<b>-0.30</b>	<b>-0.44</b>	<b>-0.15</b>	<b>-0.17</b>	<b>-0.32</b>	<b>-0.01</b>	<b>-0.17</b>	<b>-0.33</b>	<b>0.00</b>
	Regular	2.9	0.9	<b>-0.15</b>	<b>-0.28</b>	<b>-0.03</b>	-0.13	-0.25	0.00	<b>-0.13</b>	<b>-0.26</b>	<b>-0.01</b>
	Daily	3.0	0.8	0.0	ref		0.0	ref		0.0	ref	
15 (personal appearance)	Limited	2.8	0.8	<b>-0.26</b>	<b>-0.39</b>	<b>-0.13</b>	<b>-0.18</b>	<b>-0.32</b>	<b>-0.03</b>	<b>-0.17</b>	<b>-0.31</b>	<b>-0.03</b>
	Regular	3.0	0.8	-0.09	-0.20	0.02	-0.08	-0.19	0.03	-0.08	-0.20	0.03
	Daily	3.0	0.7	0.0	ref		0.0	ref		0.0	ref	
16 (personal finances)	Limited	3.2	0.8	<b>-0.18</b>	<b>-0.31</b>	<b>-0.04</b>	-0.08	-0.22	0.07	-0.07	-0.22	0.08
	Regular	3.3	0.8	-0.11	-0.23	0.00	-0.09	-0.21	0.02	-0.08	-0.20	0.04
	Daily	3.4	0.8	0.0	ref		0.0	ref		0.0	ref	
17 (faith & worldview matters)	Limited	1.8	1.2	<b>-0.31</b>	<b>-0.52</b>	<b>-0.11</b>	-0.19	-0.42	0.03	<b>-0.23</b>	<b>-0.46</b>	<b>0.00</b>
	Regular	2.0	1.2	-0.11	-0.28	0.07	-0.09	-0.27	0.09	-0.10	-0.28	0.08
	Daily	2.1	1.1	0.0	ref		0.0	ref		0.0	ref	

Note: Regression coefficients (B) and 95% confidence intervals (95%CI) derived from general linearized models with identity link function, bolded if  $p < .05$ . High= response categories 3-4.

**Table A.3.** Linear GLM on baseline UJACAS extent of doing items in groups based on baseline neighborhood mobility (n=1007).

Item	Neighborhood	Score		Age & sex adjusted			+ health & function			+ personal & environmental resources		
	mobility	Mean	± SD	B	(95%CI)		B	(95%CI)		B	(95%CI)	
1 (crafting & DIY)	Limited	1.5	1.5	<b>-0.53</b>	<b>-0.79</b>	<b>-0.28</b>	<b>-0.29</b>	<b>-0.56</b>	<b>-0.01</b>	<b>-0.30</b>	<b>-0.58</b>	<b>-0.02</b>
	Regular	2.0	1.4	-0.03	-0.25	0.19	0.04	-0.18	0.26	0.03	-0.19	0.26
	Daily	2.1	1.5	0.0	ref		0.0	ref		0.0	ref	
2 (musical & artistic pursuits)	Limited	1.0	1.3	<b>-0.24</b>	<b>-0.47</b>	<b>-0.01</b>	-0.09	-0.34	0.16	-0.11	-0.37	0.14
	Regular	1.2	1.3	-0.17	-0.36	0.03	-0.14	-0.34	0.06	-0.16	-0.36	0.05
	Daily	1.3	1.3	0.0	ref		0.0	ref		0.0	ref	
3 (participating in events)	Limited	1.0	1.0	<b>-0.60</b>	<b>-0.79</b>	<b>-0.41</b>	<b>-0.39</b>	<b>-0.60</b>	<b>-0.19</b>	<b>-0.42</b>	<b>-0.63</b>	<b>-0.21</b>
	Regular	1.4	1.1	<b>-0.19</b>	<b>-0.35</b>	<b>-0.02</b>	-0.12	-0.28	0.05	-0.12	-0.29	0.05
	Daily	1.6	1.1	0.0	ref		0.0	ref		0.0	ref	
4 (enjoying outdoor nature)	Limited	2.5	1.2	<b>-0.92</b>	<b>-1.09</b>	<b>-0.75</b>	<b>-0.71</b>	<b>-0.89</b>	<b>-0.52</b>	<b>-0.69</b>	<b>-0.88</b>	<b>-0.50</b>
	Regular	2.8	1.1	<b>-0.64</b>	<b>-0.79</b>	<b>-0.49</b>	<b>-0.58</b>	<b>-0.73</b>	<b>-0.44</b>	<b>-0.59</b>	<b>-0.73</b>	<b>-0.44</b>
	Daily	3.5	0.9	0.0	ref		0.0	ref		0.0	ref	
5 (to keep physically fit)	Limited	2.3	1.3	<b>-0.91</b>	<b>-1.10</b>	<b>-0.73</b>	<b>-0.71</b>	<b>-0.91</b>	<b>-0.52</b>	<b>-0.70</b>	<b>-0.91</b>	<b>-0.50</b>
	Regular	2.7	1.1	<b>-0.48</b>	<b>-0.64</b>	<b>-0.32</b>	<b>-0.43</b>	<b>-0.59</b>	<b>-0.27</b>	<b>-0.43</b>	<b>-0.59</b>	<b>-0.26</b>
	Daily	3.2	1.0	0.0	ref		0.0	ref		0.0	ref	
6 (exercising mind & memory)	Limited	2.9	1.4	-0.21	-0.41	0.00	-0.10	-0.32	0.13	-0.08	-0.31	0.15
	Regular	3.1	1.1	-0.06	-0.24	0.12	-0.07	-0.25	0.11	-0.06	-0.24	0.12
	Daily	3.1	1.2	0.0	ref		0.0	ref		0.0	ref	
7 (computer & pad use)	Limited	2.0	1.8	<b>-0.42</b>	<b>-0.70</b>	<b>-0.14</b>	0.03	-0.26	0.32	0.03	-0.26	0.32
	Regular	2.7	1.7	0.07	-0.17	0.31	0.17	-0.07	0.40	0.19	-0.05	0.42
	Daily	2.7	1.6	0.0	ref		0.0	ref		0.0	ref	
8 (helping & supporting others)	Limited	1.8	1.3	<b>-0.44</b>	<b>-0.66</b>	<b>-0.22</b>	-0.19	-0.42	0.05	-0.18	-0.41	0.05
	Regular	2.3	1.3	-0.03	-0.22	0.15	0.00	-0.19	0.19	-0.02	-0.20	0.17
	Daily	2.4	1.2	0.0	ref		0.0	ref		0.0	ref	
9 (maintaining friendships)	Limited	2.4	0.9	<b>-0.31</b>	<b>-0.45</b>	<b>-0.18</b>	<b>-0.21</b>	<b>-0.36</b>	<b>-0.06</b>	<b>-0.19</b>	<b>-0.34</b>	<b>-0.04</b>
	Regular	2.6	0.8	<b>-0.14</b>	<b>-0.26</b>	<b>-0.03</b>	<b>-0.12</b>	<b>-0.24</b>	<b>0.00</b>	<b>-0.12</b>	<b>-0.24</b>	<b>0.00</b>
	Daily	2.7	0.8	0.0	ref		0.0	ref		0.0	ref	
10 (meeting new people)	Limited	1.4	1.0	<b>-0.49</b>	<b>-0.66</b>	<b>-0.33</b>	<b>-0.36</b>	<b>-0.54</b>	<b>-0.18</b>	<b>-0.38</b>	<b>-0.57</b>	<b>-0.20</b>
	Regular	1.7	0.9	<b>-0.22</b>	<b>-0.37</b>	<b>-0.08</b>	<b>-0.20</b>	<b>-0.34</b>	<b>-0.05</b>	<b>-0.20</b>	<b>-0.35</b>	<b>-0.06</b>
	Daily	1.9	0.9	0.0	ref		0.0	ref		0.0	ref	
11 (life matters)	Limited	2.6	1.0	<b>-0.45</b>	<b>-0.60</b>	<b>-0.30</b>	<b>-0.32</b>	<b>-0.49</b>	<b>-0.16</b>	<b>-0.31</b>	<b>-0.48</b>	<b>-0.15</b>
	Regular	3.0	0.8	-0.11	-0.24	0.01	-0.10	-0.23	0.03	-0.08	-0.22	0.05
	Daily	3.1	0.8	0.0	ref		0.0	ref		0.0	ref	

12 (societal & communal matters)	Limited	0.9	0.9	<b>-0.55</b>	<b>-0.73</b>	<b>-0.37</b>	<b>-0.39</b>	<b>-0.59</b>	<b>-0.20</b>	<b>-0.39</b>	<b>-0.59</b>	<b>-0.19</b>
	Regular	1.3	1.0	<b>-0.17</b>	<b>-0.32</b>	<b>-0.01</b>	-0.13	-0.29	0.03	-0.13	-0.29	0.03
	Daily	1.5	1.1	0.0	ref		0.0	ref		0.0	ref	
13 (interesting days)	Limited	2.2	0.9	<b>-0.51</b>	<b>-0.64</b>	<b>-0.37</b>	<b>-0.36</b>	<b>-0.51</b>	<b>-0.22</b>	<b>-0.37</b>	<b>-0.52</b>	<b>-0.22</b>
	Regular	2.5	0.7	<b>-0.22</b>	<b>-0.34</b>	<b>-0.11</b>	<b>-0.19</b>	<b>-0.31</b>	<b>-0.07</b>	<b>-0.18</b>	<b>-0.30</b>	<b>-0.06</b>
	Daily	2.7	0.8	0.0	ref		0.0	ref		0.0	ref	
14 (cozy & pleasant home)	Limited	2.2	0.8	<b>-0.48</b>	<b>-0.63</b>	<b>-0.34</b>	<b>-0.30</b>	<b>-0.45</b>	<b>-0.14</b>	<b>-0.28</b>	<b>-0.44</b>	<b>-0.13</b>
	Regular	2.5	0.8	<b>-0.19</b>	<b>-0.32</b>	<b>-0.07</b>	<b>-0.14</b>	<b>-0.26</b>	<b>-0.02</b>	<b>-0.14</b>	<b>-0.26</b>	<b>-0.02</b>
	Daily	2.7	0.8	ref.			ref.			ref.		
15 (personal appearance)	Limited	2.8	0.7	<b>-0.15</b>	<b>-0.27</b>	<b>-0.03</b>	-0.06	-0.19	0.07	-0.05	-0.18	0.08
	Regular	2.9	0.7	-0.05	-0.15	0.05	-0.04	-0.14	0.07	-0.03	-0.14	0.07
	Daily	2.9	0.7	ref.			ref.			ref.		
16 (personal finances)	Limited	2.9	0.9	<b>-0.26</b>	<b>-0.40</b>	<b>-0.11</b>	-0.14	-0.30	0.02	-0.13	-0.29	0.03
	Regular	3.0	0.8	-0.13	-0.25	0.00	-0.10	-0.23	0.03	-0.09	-0.22	0.04
	Daily	3.1	0.8	ref.			ref.			ref.		
17 (faith & worldview matters)	Limited	1.3	1.1	<b>-0.44</b>	<b>-0.63</b>	<b>-0.25</b>	<b>-0.34</b>	<b>-0.55</b>	<b>-0.13</b>	<b>-0.39</b>	<b>-0.60</b>	<b>-0.17</b>
	Regular	1.6	1.1	<b>-0.18</b>	<b>-0.34</b>	<b>-0.01</b>	-0.16	-0.33	0.01	<b>-0.17</b>	<b>-0.34</b>	<b>-0.01</b>
	Daily	1.8	1.1	ref.			ref.			ref.		

Note: Regression coefficients (B) and 95% confidence intervals (95%CI) derived from general linearized models with identity link function, bolded if  $p < .05$ . High= response categories 3-4.

**Table A.4.** Logistic GLM on baseline UJACAS ability to act items in groups based on baseline neighborhood mobility (n=1007).

Item	Neighborhood	Prevalence	Age & sex adjusted			+ health & function			+ personal & environmental resources		
	mobility	High (%)	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)			
1 (crafting & DIY)	Limited	34.4	<b>0.37</b>	<b>0.26</b>	<b>0.54</b>	<b>0.65</b>	<b>0.43</b>	<b>0.98</b>	<b>0.64</b>	<b>0.42</b>	<b>0.99</b>
	Regular	48.5	<b>0.60</b>	<b>0.44</b>	<b>0.81</b>	0.76	0.55	1.06	0.80	0.58	1.12
	Daily	61.9	1.00			1.00			1.00		
2 (musical & artistic pursuits)	Limited	38.0	<b>0.44</b>	<b>0.30</b>	<b>0.63</b>	0.75	0.50	1.13	0.76	0.50	1.16
	Regular	49.8	<b>0.63</b>	<b>0.46</b>	<b>0.85</b>	0.76	0.55	1.05	0.77	0.55	1.07
	Daily	61.8	1.00 <sup>a</sup>			1.00			1.00		
3 (participating in events)	Limited	36.8	<b>0.25</b>	<b>0.17</b>	<b>0.37</b>	<b>0.54</b>	<b>0.35</b>	<b>0.83</b>	<b>0.54</b>	<b>0.35</b>	<b>0.84</b>
	Regular	56.2	<b>0.50</b>	<b>0.36</b>	<b>0.69</b>	<b>0.65</b>	<b>0.46</b>	<b>0.92</b>	<b>0.67</b>	<b>0.47</b>	<b>0.95</b>
	Daily	72.5	1.00			1.00			1.00		
4 (enjoying outdoor nature)	Limited	23.3	<b>0.20</b>	<b>0.13</b>	<b>0.30</b>	<b>0.38</b>	<b>0.24</b>	<b>0.60</b>	<b>0.41</b>	<b>0.26</b>	<b>0.65</b>
	Regular	40.6	<b>0.41</b>	<b>0.30</b>	<b>0.56</b>	<b>0.52</b>	<b>0.37</b>	<b>0.73</b>	<b>0.53</b>	<b>0.38</b>	<b>0.75</b>
	Daily	62.7	1.00			1.00			1.00		
5 (to keep physically fit)	Limited	22.8	<b>0.23</b>	<b>0.16</b>	<b>0.35</b>	<b>0.44</b>	<b>0.28</b>	<b>0.69</b>	<b>0.45</b>	<b>0.29</b>	<b>0.72</b>
	Regular	39.7	<b>0.48</b>	<b>0.35</b>	<b>0.65</b>	<b>0.61</b>	<b>0.44</b>	<b>0.86</b>	<b>0.63</b>	<b>0.45</b>	<b>0.88</b>
	Daily	57.8	1.00			1.00			1.00		
6 (exercising mind & memory)	Limited	58.3	<b>0.57</b>	<b>0.39</b>	<b>0.82</b>	<b>0.57</b>	<b>0.39</b>	<b>0.82</b>	0.87	0.56	1.33
	Regular	69.2	0.82	0.58	1.14	0.82	0.58	1.14	0.97	0.68	1.39
	Daily	73.2	1.00			1.00			1.00		
7 (computer & pad use)	Limited	42.0	<b>0.57</b>	<b>0.40</b>	<b>0.82</b>	0.85	0.57	1.27	0.91	0.60	1.39
	Regular	51.9	0.76	0.56	1.04	0.85	0.62	1.17	0.90	0.64	1.25
	Daily	60.1	1.00			1.00			1.00		
8 (helping & supporting others)	Limited	32.1	<b>0.23</b>	<b>0.16</b>	<b>0.33</b>	<b>0.41</b>	<b>0.27</b>	<b>0.63</b>	<b>0.42</b>	<b>0.27</b>	<b>0.65</b>
	Regular	56.0	<b>0.56</b>	<b>0.41</b>	<b>0.77</b>	<b>0.67</b>	<b>0.48</b>	<b>0.95</b>	<b>0.68</b>	<b>0.48</b>	<b>0.96</b>
	Daily	70.5	1.00			1.00			1.00		
9 (maintaining friendships)	Limited	52.8	<b>0.36</b>	<b>0.25</b>	<b>0.53</b>	<b>0.61</b>	<b>0.40</b>	<b>0.93</b>	<b>0.65</b>	<b>0.42</b>	<b>0.99</b>
	Regular	65.2	<b>0.56</b>	<b>0.40</b>	<b>0.78</b>	<b>0.67</b>	<b>0.47</b>	<b>0.94</b>	0.70	0.49	1.00
	Daily	76.9	1.00			1.00			1.00		
10 (meeting new people)	Limited	46.9	<b>0.32</b>	<b>0.22</b>	<b>0.46</b>	<b>0.57</b>	<b>0.38</b>	<b>0.86</b>	<b>0.59</b>	<b>0.38</b>	<b>0.90</b>
	Regular	62.9	<b>0.57</b>	<b>0.41</b>	<b>0.79</b>	0.72	0.51	1.02	0.77	0.54	1.10
	Daily	74.3	1.00			1.00			1.00		
11 (life matters)	Limited	49.1	<b>0.39</b>	<b>0.27</b>	<b>0.57</b>	0.76	0.50	1.16	0.79	0.51	1.21
	Regular	60.9	<b>0.58</b>	<b>0.42</b>	<b>0.81</b>	<b>0.68</b>	<b>0.49</b>	<b>0.96</b>	<b>0.69</b>	<b>0.49</b>	<b>0.98</b>
	Daily	72.9	1.00			1.00			1.00		
12 (societal & communal matters)	Limited	27.2	<b>0.31</b>	<b>0.21</b>	<b>0.45</b>	<b>0.52</b>	<b>0.34</b>	<b>0.80</b>	<b>0.57</b>	<b>0.37</b>	<b>0.88</b>
	Regular	40.7	<b>0.49</b>	<b>0.36</b>	<b>0.68</b>	<b>0.59</b>	<b>0.43</b>	<b>0.82</b>	<b>0.60</b>	<b>0.43</b>	<b>0.84</b>



	Daily	59.1	1.00			1.00			1.00		
13 (interesting days)	Limited	34.4	<b>0.31</b>	<b>0.21</b>	<b>0.45</b>	<b>0.52</b>	<b>0.35</b>	<b>0.78</b>	<b>0.55</b>	<b>0.36</b>	<b>0.83</b>
	Regular	45.5	<b>0.45</b>	<b>0.33</b>	<b>0.61</b>	<b>0.52</b>	<b>0.38</b>	<b>0.73</b>	<b>0.55</b>	<b>0.39</b>	<b>0.76</b>
	Daily	65.0	1.00 <sup>a</sup>			1.00			1.00		
14 (cozy & pleasant home)	Limited	30.1	<b>0.29</b>	<b>0.20</b>	<b>0.43</b>	<b>0.59</b>	<b>0.38</b>	<b>0.92</b>	<b>0.59</b>	<b>0.38</b>	<b>0.92</b>
	Regular	39.5	<b>0.39</b>	<b>0.29</b>	<b>0.54</b>	<b>0.49</b>	<b>0.35</b>	<b>0.69</b>	<b>0.50</b>	<b>0.35</b>	<b>0.70</b>
	Daily	62.4	1.00			1.00 <sup>a</sup>			1.00		
15 (personal appearance)	Limited	54.9	<b>0.33</b>	<b>0.23</b>	<b>0.48</b>	<b>0.61</b>	<b>0.40</b>	<b>0.94</b>	0.68	0.43	1.06
	Regular	69.7	<b>0.55</b>	<b>0.39</b>	<b>0.78</b>	<b>0.69</b>	<b>0.48</b>	<b>0.99</b>	0.69	0.47	1.01
	Daily	80.8	1.00			1.00			1.00		
16 (personal finances)	Limited	63.8	<b>0.39</b>	<b>0.26</b>	<b>0.57</b>	<b>0.60</b>	<b>0.39</b>	<b>0.94</b>	<b>0.62</b>	<b>0.39</b>	<b>0.99</b>
	Regular	75.5	<b>0.63</b>	<b>0.43</b>	<b>0.91</b>	0.70	0.48	1.04	0.75	0.50	1.11
	Daily	82.8	1.00			1.00			1.00		
17 (faith & worldview matters)	Limited	40.5	<b>0.40</b>	<b>0.28</b>	<b>0.58</b>	<b>0.63</b>	<b>0.42</b>	<b>0.94</b>	<b>0.63</b>	<b>0.41</b>	<b>0.95</b>
	Regular	52.1	<b>0.57</b>	<b>0.41</b>	<b>0.77</b>	<b>0.64</b>	<b>0.46</b>	<b>0.89</b>	<b>0.66</b>	<b>0.47</b>	<b>0.92</b>
	Daily	66.0	1.00 <sup>a</sup>			1.00			1.00		

Note: Odds ratios and 95% confidence intervals (95%CI) derived from generalized linear models with logistic link function, bolded if  $p < .05$ . High= response category 4. <sup>a</sup> Validity of the model fit is uncertain as the maximum number of step-halvings was reached but the log-likelihood value did not further improve.

**Table A.5.** Linear GLM on baseline UJACAS opportunity to act items in groups based on baseline neighborhood mobility (n=1007).

Item	Neighborhood	Score		Age & sex adjusted			+ health & function			+ personal & environmental resources		
	mobility	Mean	± SD	B	(95%CI)		B	(95%CI)		B	(95%CI)	
1 (crafting & DIY)	Limited	2.4	1.1	<b>-0.49</b>	<b>-0.67</b>	<b>-0.30</b>	-0.13	-0.33	0.06	-0.13	-0.33	0.06
	Regular	2.7	1.1	<b>-0.26</b>	<b>-0.42</b>	<b>-0.10</b>	-0.15	-0.30	0.01	-0.12	-0.28	0.03
	Daily	3.0	1.0	ref.			ref.			ref.		
2 (musical & artistic pursuits)	Limited	2.0	1.2	<b>-0.60</b>	<b>-0.79</b>	<b>-0.40</b>	<b>-0.34</b>	<b>-0.54</b>	<b>-0.13</b>	<b>-0.32</b>	<b>-0.53</b>	<b>-0.11</b>
	Regular	2.5	1.1	<b>-0.22</b>	<b>-0.39</b>	<b>-0.06</b>	-0.15	-0.31	0.02	-0.14	-0.31	0.03
	Daily	2.7	1.1	ref.			ref.			ref.		
3 (participating in events)	Limited	2.3	1.1	<b>-0.64</b>	<b>-0.81</b>	<b>-0.47</b>	<b>-0.29</b>	<b>-0.47</b>	<b>-0.12</b>	<b>-0.27</b>	<b>-0.45</b>	<b>-0.09</b>
	Regular	2.7	1.0	<b>-0.31</b>	<b>-0.45</b>	<b>-0.16</b>	<b>-0.22</b>	<b>-0.36</b>	<b>-0.08</b>	<b>-0.19</b>	<b>-0.34</b>	<b>-0.05</b>
	Daily	3.0	0.9	ref.			ref.			ref.		
4 (enjoying outdoor nature)	Limited	2.7	1.1	<b>-0.78</b>	<b>-0.93</b>	<b>-0.63</b>	<b>-0.43</b>	<b>-0.59</b>	<b>-0.28</b>	<b>-0.43</b>	<b>-0.58</b>	<b>-0.27</b>
	Regular	3.1	1.0	<b>-0.36</b>	<b>-0.49</b>	<b>-0.23</b>	<b>-0.26</b>	<b>-0.39</b>	<b>-0.14</b>	<b>-0.24</b>	<b>-0.37</b>	<b>-0.12</b>
	Daily	3.5	0.7	ref.			ref.			ref.		
5 (to keep physically fit)	Limited	2.5	1.0	<b>-0.79</b>	<b>-0.94</b>	<b>-0.63</b>	<b>-0.36</b>	<b>-0.51</b>	<b>-0.20</b>	<b>-0.36</b>	<b>-0.52</b>	<b>-0.20</b>
	Regular	3.0	1.0	<b>-0.32</b>	<b>-0.45</b>	<b>-0.19</b>	<b>-0.20</b>	<b>-0.32</b>	<b>-0.07</b>	<b>-0.17</b>	<b>-0.30</b>	<b>-0.05</b>
	Daily	3.4	0.8	ref.			ref.			ref.		
6 (exercising mind & memory)	Limited	3.0	0.9	<b>-0.31</b>	<b>-0.45</b>	<b>-0.18</b>	-0.10	-0.24	0.05	-0.08	-0.22	0.07
	Regular	3.3	0.8	<b>-0.14</b>	<b>-0.26</b>	<b>-0.03</b>	-0.09	-0.20	0.03	-0.10	-0.21	0.02
	Daily	3.4	0.7	ref.			ref.			ref.		
7 (computer & pad use)	Limited	2.4	1.5	<b>-0.46</b>	<b>-0.68</b>	<b>-0.24</b>	-0.04	-0.27	0.18	0.00	-0.22	0.23
	Regular	3.0	1.4	-0.08	-0.27	0.11	0.02	-0.17	0.20	0.03	-0.15	0.21
	Daily	3.1	1.2	ref.			ref.			ref.		
8 (helping & supporting others)	Limited	2.3	1.1	<b>-0.79</b>	<b>-0.95</b>	<b>-0.62</b>	<b>-0.44</b>	<b>-0.61</b>	<b>-0.27</b>	<b>-0.42</b>	<b>-0.59</b>	<b>-0.24</b>
	Regular	2.9	1.0	<b>-0.25</b>	<b>-0.39</b>	<b>-0.11</b>	<b>-0.16</b>	<b>-0.30</b>	<b>-0.02</b>	<b>-0.15</b>	<b>-0.28</b>	<b>-0.01</b>
	Daily	3.1	0.9	ref.			ref.			ref.		
9 (maintaining friendships)	Limited	2.7	1.0	<b>-0.48</b>	<b>-0.62</b>	<b>-0.33</b>	<b>-0.26</b>	<b>-0.41</b>	<b>-0.11</b>	<b>-0.24</b>	<b>-0.40</b>	<b>-0.09</b>
	Regular	3.0	0.9	<b>-0.25</b>	<b>-0.37</b>	<b>-0.13</b>	<b>-0.19</b>	<b>-0.31</b>	<b>-0.07</b>	<b>-0.17</b>	<b>-0.29</b>	<b>-0.04</b>
	Daily	3.3	0.7	ref.			ref.			ref.		
10 (meeting new people)	Limited	2.2	1.0	<b>-0.69</b>	<b>-0.85</b>	<b>-0.53</b>	<b>-0.47</b>	<b>-0.64</b>	<b>-0.29</b>	<b>-0.44</b>	<b>-0.62</b>	<b>-0.27</b>
	Regular	2.6	0.9	<b>-0.29</b>	<b>-0.43</b>	<b>-0.16</b>	<b>-0.23</b>	<b>-0.36</b>	<b>-0.09</b>	<b>-0.21</b>	<b>-0.35</b>	<b>-0.07</b>
	Daily	2.9	0.9	ref.			ref.			ref.		
11 (life matters)	Limited	2.9	0.9	<b>-0.39</b>	<b>-0.52</b>	<b>-0.25</b>	-0.11	-0.26	0.03	-0.08	-0.22	0.06
	Regular	3.2	0.8	<b>-0.15</b>	<b>-0.27</b>	<b>-0.03</b>	-0.09	-0.21	0.03	-0.07	-0.18	0.05
	Daily	3.3	0.8	ref.			ref.			ref.		
12 (societal & communal matters)	Limited	1.9	1.0	<b>-0.55</b>	<b>-0.73</b>	<b>-0.37</b>	<b>-0.26</b>	<b>-0.45</b>	<b>-0.07</b>	<b>-0.26</b>	<b>-0.45</b>	<b>-0.06</b>
	Regular	2.2	1.0	<b>-0.27</b>	<b>-0.42</b>	<b>-0.11</b>	<b>-0.18</b>	<b>-0.33</b>	<b>-0.02</b>	<b>-0.16</b>	<b>-0.31</b>	<b>-0.01</b>

13 (interesting days)	Daily	2.5	1.0	ref.			ref.			ref.		
	Limited	2.5	0.9	<b>-0.62</b>	<b>-0.76</b>	<b>-0.48</b>	<b>-0.37</b>	<b>-0.51</b>	<b>-0.22</b>	<b>-0.37</b>	<b>-0.52</b>	<b>-0.21</b>
	Regular	2.9	0.8	<b>-0.29</b>	<b>-0.41</b>	<b>-0.16</b>	<b>-0.22</b>	<b>-0.34</b>	<b>-0.10</b>	<b>-0.20</b>	<b>-0.32</b>	<b>-0.08</b>
14 (cozy & pleasant home)	Daily	3.2	0.8	ref.			ref.			ref.		
	Limited	2.6	1.0	<b>-0.59</b>	<b>-0.73</b>	<b>-0.45</b>	<b>-0.25</b>	<b>-0.40</b>	<b>-0.11</b>	<b>-0.23</b>	<b>-0.38</b>	<b>-0.09</b>
	Regular	2.9	0.8	<b>-0.24</b>	<b>-0.36</b>	<b>-0.11</b>	<b>-0.13</b>	<b>-0.25</b>	<b>-0.01</b>	-0.11	-0.23	0.00
15 (personal appearance)	Daily	3.2	0.8	ref.			ref.			ref.		
	Limited	3.0	0.8	<b>-0.44</b>	<b>-0.56</b>	<b>-0.32</b>	<b>-0.23</b>	<b>-0.35</b>	<b>-0.10</b>	<b>-0.21</b>	<b>-0.34</b>	<b>-0.09</b>
	Regular	3.3	0.7	<b>-0.17</b>	<b>-0.27</b>	<b>-0.07</b>	<b>-0.11</b>	<b>-0.21</b>	<b>-0.01</b>	-0.10	-0.20	0.00
16 (personal finances)	Daily	3.5	0.6	ref.			ref.			ref.		
	Limited	3.0	0.9	<b>-0.31</b>	<b>-0.44</b>	<b>-0.18</b>	-0.12	-0.26	0.02	-0.10	-0.24	0.03
	Regular	3.2	0.8	<b>-0.13</b>	<b>-0.25</b>	<b>-0.02</b>	-0.09	-0.20	0.02	-0.07	-0.18	0.03
17 (faith & worldview matters)	Daily	3.4	0.7	ref.			ref.			ref.		
	Limited	2.2	1.0	<b>-0.57</b>	<b>-0.74</b>	<b>-0.39</b>	<b>-0.36</b>	<b>-0.55</b>	<b>-0.17</b>	<b>-0.36</b>	<b>-0.55</b>	<b>-0.17</b>
	Regular	2.5	1.0	<b>-0.25</b>	<b>-0.40</b>	<b>-0.09</b>	<b>-0.20</b>	<b>-0.36</b>	<b>-0.05</b>	<b>-0.20</b>	<b>-0.36</b>	<b>-0.05</b>
	Daily	2.8	1.0	ref.			ref.			ref.		

Note: Regression coefficients (B) and 95% confidence intervals (95%CI) derived from generalized linear models with identity link function, bolded if  $p < .05$ .