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# Leisure-time management and subjective well-being among older adults: a three-wave longitudinal survey

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**Short title**: Leisure-time management and well-being

## Highlights

- We examined the longitudinal association between leisure-time management and subjective well-being.
- We conducted a three-wave longitudinal survey for older adults.
- We found that leisure-time management is a determinant of subjective well-being among them.

## Abstract

***Aim***: As older adults have longer leisure time and the types and influences of leisure activities they participate in are diverse, appropriate management of their leisure time would be important to optimize their subjective well-being. Although greater use of time management in educational and occupational settings is associated with better job performance, academic achievement, and the well-being of workers and students, few studies have investigated time management in leisure settings. This study aimed to examine the longitudinal association between leisure-time management and subjective well-being among older adults.

***Methods***: Data on 879 individuals in Nada Ward, Kobe, Japan were obtained from a three-wave questionnaire-based longitudinal survey (Wave 1: December 2017 to January 2018; Wave 2: after one year; Wave 3: after three years). In each survey, leisure-time management (newly developed in this study) and subjective well-being (simplified Japanese version of the World Health Organization Five Well-Being Index) were measured. This study used a cross-lagged model to analyze the longitudinal association between leisure-time management and subjective well-being after considering their inverse association.

***Results***: The cross-lagged model indicated that that the standardized path coefficients from leisure-time management in Wave 1 to subjective well-being in Wave 2 (0.13, $p<0.001$) and from leisure-time management in Wave 2 to subjective well-being in Wave 3 (0.06, $p=0.042$) were positive and significant.

***Conclusions***: This study found that leisure-time management is a determinant of subjective well-being among older adults. This finding indicates that the management of leisure time elevates one's subjective well-being among them.



***Keywords****:* Aged; Leisure Activities; Psychological Well-Being; Quality of Life; Time Management

## 1. Introduction

Maintaining and elevating subjective well-being are important for the health of older adults (Steptoe et al., 2015). Subjective well-being is captured through evaluative, hedonic, and eudemonic well-being (Steptoe et al., 2015). Epidemiological studies have shown that subjective well-being is associated with a lower risk of cardiovascular disease (Whyne et al., 2023) and increased lifespan and health span (Minagawa & Saito, 2022). Identifying the determinants of older adults' subjective well-being is essential for establishing intervention strategies to improve their subjective well-being. Previous studies have reported that multilevel factors such as their personalities (Anglim et al., 2020), financial problems (Samuel et al., 2022), social networks (Harada et al., 2021), and physical environments (Padeiro et al., 2022) determine subjective well-being.

In addition to the aforementioned factors, leisure is a key determinant of subjective well-being among older adults. Leisure time refers to an individual's free time (Fancourt et al., 2021). As people age, their leisure time also increasing (Statistics Bureau of Japan, 2022). For example, the average leisure time among the Japanese population is 5.2 hours/day for those aged 45 to 54 years old, 5.9 hours/day for those aged 55 to 64 years, and 8.2 hours/days for those aged 65 years old or more (Statistics Bureau of Japan, 2022). People spend their leisure time in various ways such as viewing television, reading, resting, engaging sports, volunteering, meeting others, and so on (Statistics Bureau of Japan, 2022). The theoretical framework proposes that the influence of engagement in leisure activities is multilevel (Fancourt et al., 2021). Previous studies have reported that the influence of leisure activities on subjective well-being is diverse: while spending longer time in physical (Buecker et al., 2021), music (Dingle et al., 2021), and volunteer (Kim et al., 2020) activities is associated with better subjective well-being, spending longer time viewing television (Yasunaga et al., 2021) is associated with worse subjective well-being. Older adults spend a larger proportion of their leisure time with television,

radio, newspaper or magazine. From the Japanese national survey, those aged 45 to 54 years, aged 55 to 64 years, and aged 65 years or more spend 31.1% (1.6 hours/day), 41.7% (2.5 hours/day), and 50.2% (4.1 hours/day) of their leisure time with such media, respectively (Statistics Bureau of Japan, 2022). Both relative and absolute increase of time for spending with such media among older adults might reflect that a considerable number might waste their increased leisure time.

Appropriate management of leisure time would be important for older adults to optimize subjective well-being. Time management is a widely accepted concept in educational and occupational studies (Aeon et al., 2021). In such studies, time management represents one's efforts to structure, protect, and adopt one's time to achieve desirable conditions (Aeon & Aguinis, 2017). A meta-analysis has shown that greater use of time management is a determinant of better job performance, academic achievement, and well-being among workers and students (Aeon et al., 2021). Considering the age-related increase in leisure time, the diversity of types and influences of leisure activities, and an increasing proportion of television or other media in leisure time, the importance of time management may also apply to leisure time among older adults. Wang et al. developed a scale to measure free time management, which is exchangeable for leisure time, and showed that increased use of free time management is cross-sectionally associated with a higher quality of life among university students (Wang et al., 2011) and older adults (Wang et al., 2014). As quality of life overlaps with subjective well-being (Skevington & Böhnke, 2018), these findings (Wang et al., 2011, 2014) could be generalized to subjective well-being. However, as a meta-analysis showed that the associations between engagement in leisure activities and subjective well-being are bidirectional (Kuykendall et al., 2015), the associations between leisure-time management and subjective well-being might also be bidirectional. Further longitudinal examinations are needed to confirm the association between leisure-time management and subjective well-being.

This study examined the longitudinal association between leisure-time management with subjective well-being among older adults. This study hypothesized that more employment in leisure-time management would influence better status in subjective well-being, after considering the influences of subjective well-being on leisure-time management.

## 2. Materials and Methods

### 2.1. Participants and Procedures

This study analyzed data from our longitudinal questionnaire survey, which was conducted as a large research project for older adults living in Nada Ward, Kobe City, Japan. We reported the detailed process in our previously-published paper (Harada et al., 2022). Based on this survey, we have published and submitted several other papers.

At the baseline (December 2017 to January 2018: Wave 1), we asked all men aged 64, 69, or 74 years on the first day of April 2017 living in Nada Ward and their wives to respond our survey via postal mail (n = 3720), and 1784 responded it. However, as 705 respondents in the baseline survey did not agree to further contact from us, we asked 1,079 individuals to respond to a one-year follow-up survey from December 2018 to January 2019 (Wave 2) and a three-year follow-up survey from December 2020 to January 2021 (Wave 3) via postal mail. Among them, 919 and 854 individuals responded to the one- and three-year follow-up surveys, respectively. The control number and informed consent form were printed on the first page of the questionnaire for each survey. We identified the respondents by their control numbers and signatures on this form and then linked the responses of all surveys.

As this study developed a new scale for leisure-time management, this study utilized the data of 1,650 people for the analyses of structural validity and internal consistency of the scale, the data of 838 people for the analyses of test-retest reliability of the scale, and the data of 879 individuals for longitudinal analyses of leisure-time management and subjective well-

being. Figure 1 shows the reasons for their exclusion from the corresponding analyses.

Written informed consent was obtained from all participants, and the survey was approved by the Ethics Committee of the Graduate School of Human Development and Environment, Kobe University (no. 549-2). All the study procedures were conducted in accordance with the principles of the Declaration of Helsinki.

## 2.2. Measures

### *2.2.1 Leisure-time management*

We developed a new scale for leisure-time management because Japanese scales were not available and the existing scale in a foreign language (Free Time Management Scale (Wang et al., 2011, 2014)) might have room for improvement, such as the inclusion of items about the use of social relationships. Using social relationships (e.g., eliciting social support, modeling other people, comparing to other people, and receiving social rewards) is regarded as one of the major behavior change techniques (Michie et al., 2013). After reviewing the Free Time Management Scale (Wang et al., 2011, 2014), two major time management scales for workers and students(Britton & Tesser, 1991; Macan, 1994), the Behavior Change Technique Taxonomy (Michie et al., 2013) and a scale for measuring the self-management skills of exercise behavior (Takeda et al., 2009), which is a popular leisure activity, we assumed that seven strategies (information seeking, eliciting social support, social modelling, review of goals, action planning, goal setting, and self-monitoring) might be common for older Japanese adults to manage their leisure time. Referring to the text presentations of such scales (Britton & Tesser, 1991; Macan, 1994; Takeda et al., 2009; Wang et al., 2011, 2014), we created one item corresponding to measuring one strategy, as shown in Table 1. Items 1, 2, 3, 4, 5, 6, and 7 (Table 1) correspond to information seeking, eliciting social support, social modelling, review of goals, action planning, goal setting, and self-monitoring, respectively. We employed 5-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). This scale was used for each wave.

126 *2.2.2. Subjective well-being*

127 This study analyzed data from the simplified Japanese version of the World Health
128 Organization Five Well-Being Index (Inagaki et al., 2013) for each wave. This index is globally
129 accepted as the measure of subjective well-being (Topp et al., 2015). The simplified Japanese
130 version employs 4-point Likert scale ranging from 0 to 3 to respond to each item. This study
131 summed the scores of the five items (range: 0–15) for each wave. Higher scores represent higher
132 levels of subjective well-being.

133 *2.2.3. Demographic factors*

134 This study analyzed the baseline data on age, gender (men, women), educational background
135 (junior high to high school, above high school), living alone (no, yes), engagement in paid work
136 (no, yes), and frailty (non-frail, frail). Frailty was classified using the score (cut-off point, 7/8
137 (Satake et al., 2016)) of the Kihon Checklist (Ministry of Health, 2009).

138 **2.3. Analyses**

139 The data from Wave 1 (n = 1650) were analyzed for the factor structure and internal
140 consistency of the leisure-time management scale. If the Pearson's correlation coefficients
141 among the candidate items were higher than 0.80, we excluded one item with higher kurtosis
142 and skewness than the other item. We conducted confirmatory factor analysis using a one-factor
143 structure. The comparative fit index (CFI), normed fit index (NFI), and root mean square error
144 of approximation (RMSEA) were used as model fit indices. If the standardized factor loadings
145 were < 0.40, the initial model was revised by removing the corresponding item. Furthermore,
146 if the CFI or NFI were lower than 0.90 or RMSEA was higher than 0.09, we also revised the
147 model by removing one item by referring to the modification index (estimated decrease in $\chi$ 2
148 value). We summed the scores of the items included in the revised model as the leisure-time
149 management scale score. Cronbach's alpha was calculated as an index of internal consistency.
150 For the one-year test-retest reliability, we calculated the intraclass correlation coefficient (ICC)

using a single measurement, absolute agreement, and two-way random-effects model (n = 838). Next, by imputing missing values using the multiple imputation method with the Markov chain Monte Carlo approach (30 datasets), Pearson's correlation coefficients between leisure-time management in each wave, subjective well-being in each wave, and demographic factors in Wave 1 were calculated for 872 individuals.

Then, by handling missing values using full information maximum likelihood estimation (FIML), we performed a cross-lagged model for the longitudinal associations between leisure-time management and subjective well-being. As the cross-lagged model specifies the two types of longitudinal paths (from the independent variable to dependent variable and the dependent variable to independent variable) within one model, it can directly examine the longitudinal and bidirectional associations (Martens & Haase, 2006). Using the cross-lagged model is a well-accepted method in the research area of gerontology to examine bidirectional associations in longitudinal studies (Domènech-Abella et al., 2021; Okely et al., 2019; Yang et al., 2020). We examined their associations over two timeframes (first timeframe, Wave 1 to Wave 2; second timeframe, Wave 2 to Wave 3). The cross-lagged model specified four types of paths: 1) autoregressive paths within leisure-time management and subjective well-being, 2) lagged paths from leisure-time management in prior waves to subjective well-being in posterior waves, 3) lagged paths from subjective well-being in prior waves to leisure-time management in posterior waves, and 4) cross-sectional paths from demographic factors to leisure-time management and subjective well-being in Wave 1. Cross-sectional correlations between the demographic factors in Wave 1 and between leisure time-management and subjective well-being in each wave were included in the model. In the cross-lagged model, if the lagged paths from leisure-time management in the prior waves to subjective in the posterior waves were positive and statistically significant in both timeframes, we justified the hypothesis. Furthermore, this study conducted an additional analysis of the cross-lagged model to address

possible attrition bias. Using FIML, additional analysis included the data of 727 individuals who did not respond to both Wave 2 and Wave 3 surveys. FIML is recommended for reducing attrition bias in longitudinal studies (Lee et al., 2019) and previous longitudinal studies have employed this method (e.g. Li et al., 2023; Mallory et al., 2021; Tóth-Király et al., 2021).We used IBM SPSS AMOS 25 to perform confirmatory factor analyses, the cross-lagged model, and IBM SPSS Statistics 25 to perform other analyses. Statistical significance was set at $P < 0.05$

## 3. Results

### 3.1. Characteristics of Participants

Table 2 shows the characteristics of the participants (n = 1650). The mean age was 68.0 years and 39.3% were women. Compared with those excluded from the analyses for rest-retest reliability and longitudinal associations of leisure-time management and subjective well-being, those included in these analyses were likely to have a higher educational background and higher scores on leisure-time management and subjective well-being. In addition, compared with those excluded from the analyses for the longitudinal associations, those included in the analyses were less likely to be frail.

### 3.2. Psychometric Properties of Leisure Time Management Scale

Among the candidate items of the leisure-time management scale (Table 1), the Pearson's correlation coefficient between items 5 and 6 was higher than 0.80. We excluded item 6 from further analyses, considering its skewness and kurtosis values.

In the initial confirmatory factor analysis model (Figure 2), while the standardized factor loadings were higher than 0.40 for all items, the model fit indices were poor (CFI=0.898, NFI=0.896, RMSEA=0.150). Referring to the modification index, we justified the exclusion of item 2 from the initial model as desirable. Figure 3 shows the revised model, excluding item 2.

The revised model (Figure 3) showed an improvement in the fit indices (CFI=0.979, NFI=0.977, RMSEA=0.074).

Among the five items included in the revised model of confirmatory factor analysis, the Cronbach's alpha was 0.78.

The ICC for the one-year test-retest reliability was 0.68 (95% confidence interval, 0.64 0.71).

### 3.3. Longitudinal Associations of Leisure-time Management and Subjective Well-being

The subjective well-being scores in Waves 2 and 3 were significantly lower than those in Wave 1, whereas significant longitudinal changes in leisure-time management were not observed (Table 3). The cross-sectional correlation coefficients between leisure time-management and subjective well-being in each wave were 0.26 to 0.32 (Table 4).

Figure 4 presents the results of the cross-lagged model. The standardized path coefficients from leisure-time management in the prior waves to subjective well-being in the posterior waves were positive and significant in both timeframes, supporting the hypothesis. Furthermore, the standardized path coefficients from subjective well-being to leisure-time management were positive and significant for both timeframes. The additional analysis of the cross-lagged model, which included the non-respondents of both the Wave 2 and Wave 3 surveys, showed the same results as the main analysis (Figure 5).

## 4. Discussions

Supporting the hypothesis, this study found that leisure-time management is a determinant of subjective well-being among older adults. We should note that because the values of standardized path coefficients were 0.13 in the first timeframe (Wave 1 to Wave 2) and 0.06 in the second timeframe (Wave 2 to Wave 3), the clinical and practical impacts of leisure-time management might be weak. However, we emphasize that our findings are replicable, as the hypothesis was supported in both first and second timeframes. Our findings

indicate that increased use of management for leisure time spending would elevate subjective well-being. This study advances our understanding of determinants of subjective well-being. The majority of previous studies have captured leisure from the aspect of engagement (Buecker et al., 2021; Dingle et al., 2021; Fancourt et al., 2021; Kim et al., 2020; Kuykendall et al., 2015; Statistics Bureau of Japan, 2022; Yasunaga et al., 2021) rather than self-management, and have reported the diversity of the types (Statistics Bureau of Japan, 2022) and influences of engagement in leisure activities (Buecker et al., 2021; Dingle et al., 2021; Kim et al., 2020; Yasunaga et al., 2021), implying the importance of managing leisure time to obtain benefits. Time management in educational and occupational settings is a well-accepted concept that determines well-being (Aeon et al., 2021). However, except for a few cross-sectional examinations (Wang et al., 2011, 2014), scientific evidence on the role of time management in leisure settings is limited. Our longitudinal examination supports and strengthens previous findings from cross-sectional examinations (Wang et al., 2011, 2014). Moreover, using a cross-lagged model, the present study showed that subjective well-being is also a determinant of leisure-time management and that the values of path coefficients from subjective well-being to leisure-time management (Wave 1 to Wave 2, 0.06; Wave 2 to Wave 3, 0.10) are parallel to those from leisure-time management to subjective well-being (Wave 1 to Wave 2, 0.13; Wave 2 to Wave 3, 0.06). Similar to the present study, a previous meta-analysis for longitudinal studies (Kuykendall et al., 2015) showed that the estimated value of the regression coefficient from leisure satisfaction to subjective well-being ($\beta$=0.15) is equal to it from subjective well-being to leisure satisfaction ($\beta$=0.16). Supporting their bidirectional relationship, the meta-analysis (Kuykendall et al., 2015) and this study consistently suggest that people with better subjective well-being would come to have better management and satisfaction with their leisure time.

To understand the potential mechanisms of the link between leisure-time management and subjective well-being, a conceptual model for the psychological process of leisure

influences on subjective well-being (Newman et al., 2014) would be helpful. Integrating relevant psychological theories, the conceptual model (Newman et al., 2014) proposes that engagement in certain leisure activities provides feelings of relaxation, autonomy, mastery, and affiliation, which elevate satisfaction with leisure and promote subjective well-being. The employment of leisure-time management and engagement in desirable leisure activities (Buecker et al., 2021; Dingle et al., 2021; Kim et al., 2020) might positively interact with each other; the employment of leisure-time management might facilitate more engagement in such activities, and engagement in such activities might facilitate more employment of leisure-time management. From this conceptual model (Newman et al., 2014), their interaction might provide feelings of relaxation, autonomy, mastery, and affiliation and in turn, accumulations of such feelings might elevate subjective well-being. As this study did not measure such potential mediators, further examination of the mechanisms could strengthen the scientific foundation of the association between leisure-time management and subjective well-being.

This study has several limitations. First, this study has a selection bias. Approximately half of the individuals did not respond to the Wave 1 survey. Moreover, as shown in Table 2, approximately half of the respondents in Wave 1 were excluded from the test-test reliability and longitudinal association analyses. The baseline characteristics of the excluded individuals differed significantly from those of the included individuals. Despite the concordance between the main and additional analyses of longitudinal associations, selection bias weakens the generalizability of the findings. Second, this study did not examine potentially important confounders and mediators of the association between leisure-time management and subjective well-being. For example, the amounts of free time might be such a confounder, and as discussed above, feelings of relaxation, autonomy, mastery, and affiliation, satisfaction with leisure, and engagements in various leisure activities might be such mediators. Moreover, this study did not consider longitudinal changes in time-varying demographic factors such as engagement in paid

work and frailty. Third, both leisure-time management and subjective well-being are vulnerable to response style bias as measured by self-reporting. Finally, this study did not sufficiently confirm the validity and reliability of the leisure-time management scale. The RMSEA (0.074) and ICC (0.68) values in this study did not reach optimal levels (RMSEA, less than 0.06; ICC, 0.70 or higher) (Prinsen et al., 2018). A shorter test-retest reliability interval would be more appropriate instead of one year. Moreover, this study did not examine criteria, content, and cross-cultural validities. Further studies should reduce selection bias, consider more confounders, clarify the mediating process of the association, and improve and confirm the validity and reliability of the scale. Nonetheless, this study contributes to the establishment of desirable ways of managing leisure time to optimize the subjective well-being of older adults.

As for the practical implications of our findings, implementing interventions for older adults to promote information seeking and social models about leisure time spending and planning, monitoring, and reviewing their leisure time spending might be effective in elevating their subjective well-being. In the area of health behavior, intervention studies have commonly employed reviews of goals, action planning, and self-monitoring as strategies to promote health behavior change (Spring et al., 2021). Previous studies have also developed and implemented time management programs in educational and occupational settings (Aeon & Aguinis, 2017). Based on such trends (Aeon & Aguinis, 2017; Spring et al., 2021), it might be feasible to implement interventions to promote leisure-time management among older adults.

## 5. Conclusions

This study examined the longitudinal association between leisure-time management with subjective well-being among older adults. We found that leisure-time management is a determinant of subjective well-being among older adults.

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## Disclosure statement

The authors declare no conflict of interest.

## Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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## Figure Captions

*Figure 1*. Flowchart of the participants and procedure.

*Figure 2.* Initial model for factor structure of leisure-time management scale. Values represent standardized factor loadings. The model fit indices were $\chi^2(9)=342.1$, CFI=0.898, NFI=0.896, RMSEA=0.150

*Figure 3*. Revised model for factor structure of leisure-time management scale. Values represent standardized factor loadings. The model fit indices were $\chi^2(5)=49.9$, CFI=0.979, NFI=0.977, RMSEA=0.074

*Figure 4*. Cross-lagged model for longitudinal and bidirectional association of leisure-time management with subjective well-being (main analysis, n=879). Values represent standardized path coefficients. Bold lines represent significant paths and dashed lines represent insignificant paths. For clarity, cross-sectional paths within demographic factors were not displayed. Gender (men = 0, women = 1), educational background (junior-high to high school = 0, upper than high school = 1), living alone (no = 0, yes = 1), engagement in paid work (no = 0, yes = 1), and frailty (non-frail = 0, frail = 1) were treated as dummy variables. The model fit indices were $\chi^2(28)=222.8$, CFI=0.920, NFI=0.912, and RMSEA=0.089.

*Figure 5*. Cross-lagged model for longitudinal and bidirectional association of leisure-time management with subjective well-being (additional analysis, n=1606). Values represent standardized path coefficients. Bold lines represent significant paths and dashed lines represent insignificant paths. For clarity, cross-sectional paths within demographic factors were not displayed. Gender (men = 0, women = 1), educational background (junior-high to high school = 0, upper than high school = 1), living alone (no = 0, yes = 1), engagement in paid work (no = 0, yes = 1), and frailty (non-frail = 0, frail = 1) were treated as dummy variables. The model fit indices were $\chi^2(28)=223.0$, CFI=0.930, NFI=0.922, and RMSEA=0.066.

*Table 1*. Descriptive statistics and Pearson's correlation of candidate items for leisure time self-regulation scale

| | Descriptive statistics | | | | Pearson's correlation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | M | SD | Skewness | Kurtosis | Item 1 | Item 2 | Item 3 | Item 4 | Item 5 | Item 6 |
| Item 1. I usually gather information on how to spend my leisure time (自分の自由になる時間の過ごし方の情報を集めている). | 2.89 | 1.16 | 0.01 | -0.87 | | | | | | |
| Item 2. I usually talk together about how to spend my leisure time with others (自分の自由になる時間の過ごし方について、周りの人と話をしたり、相談したりしている). | 2.55 | 1.16 | 0.25 | -0.94 | 0.57 | | | | | |
| Item 3. There are models close to me about how to spend my leisure time (自分の自由になる時間の過ごし方について、身近にお手本となる人がいる). | 2.44 | 1.16 | 0.38 | -0.81 | 0.40 | 0.60 | | | | |
| Item 4. I usually review whether I am able to spend my leisure time well (自分の自由になる時間を、上手に過ごせているかどうか振り返っている). | 2.81 | 1.11 | -0.06 | -0.80 | 0.51 | 0.44 | 0.44 | | | |
| Item 5. I usually make plans for how to spend my leisure time (自分の自由になる時間の使い方の計画を立てている). | 2.84 | 1.21 | 0.02 | -1.00 | 0.53 | 0.44 | 0.38 | 0.55 | | |
| Item 6. I usually set goals for what I want to do in my leisure time (自分の自由になる時間にやりたいことについて、目標を立てている). | 2.89 | 1.22 | -0.01 | -1.04 | 0.50 | 0.39 | 0.32 | 0.54 | 0.82 | |
| Item 7. I usually keep records, for example write diaries, of how I spend my leisure time (自分の自由になる時間をどのように過ごしているのかを日記などに記録している). | 2.00 | 1.30 | 0.98 | -0.41 | 0.32 | 0.26 | 0.28 | 0.32 | 0.44 | 0.43 |

Five-point Likert scale was employed to answer each item: "strongly disagree (全く当てはまらない) [1]," "somewhat disagree (あまり当てはまらない) [2]," "neither (どちらともいえない) [3]," "somewhat agree (少し当てはまる) [4]," and "strongly agree (とてもよく当てはまる) [5]."

The original questionnaire was written in Japanese. In the process of preparing the draft of this paper, we translated the original Japanese items into English and then sought grammatical checks from an English proofreading and editing company.

M, mean; SD, standard deviation

*Table 2*. Baseline characteristics of participants

| | | | Analyses for test-retest reliability | | | | | Analyses for longitudinal associations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total (n =1650) | | Excluded (n = 812) | | Included (n = 838) | | | Excluded (n = 771) | | Included (n = 879) | | |
| | n | M (SD) or % | n | M (SD) or % | n | M (SD) or % | p-value | n | M (SD) or % | n | M (SD) or % | p-value |
| Age (years), M | 1650 | 68.0 (4.2) | 812 | 68.1 (4.1) | 838 | 68.0 (4.3) | 0.769[a] | 771 | 68.2 (4.1) | 879 | 67.9 (4.3) | 0.162[a] |
| Gender (women), % | 1650 | 39.3% | 812 | 40.8% | 838 | 37.9% | 0.242[b] | 771 | 39.2% | 879 | 39.5% | 0.899[b] |
| Educational background (beyond high school), % | 1632 | 48.3% | 798 | **44.5%** | 834 | **52.0%** | **0.002**[b] | 757 | **42.8%** | 875 | **53.1%** | **<0.001**[b] |
| Living alone (yes), % | 1639 | 7.1% | 807 | 6.7% | 832 | 7.5% | 0.548[b] | 766 | 6.9% | 873 | 7.2% | 0.815[b] |
| Engagement in paid work (yes), % | 1577 | 48.1% | 771 | 49.2% | 806 | 47.1% | 0.424[b] | 732 | 46.7% | 845 | 49.3% | 0.298[b] |
| Frailty (yes), % | 1617 | 9.8% | 790 | 11.0% | 827 | 8.7% | 0.119[b] | 747 | **11.6%** | 870 | **8.3%** | **0.023**[b] |
| Leisure-time management (score, 5 to 25), M | 1650 | 13.0 (4.3) | 812 | **12.6 (4.3)** | 838 | **13.4 (4.3)** | **<0.001**[a] | 771 | **12.5 (4.2)** | 879 | **13.4 (4.4)** | **<0.001**[a] |
| Subjective well-being (score, 0 to 15), M | 1644 | 9.3 (2.9) | 809 | **9.2 (2.9)** | 835 | **9.5 (2.8)** | **0.015**[a] | 767 | **9.1 (2.9)** | 877 | **9.6 (2.8)** | **0.001**[a] |

[a]t-test, [b]chi-squared test

The sample size for each variable varied due to missing values. Values in bold indicate statistical significance ($p<0.05$).

*Table 3*. Leisure-time management and subjective well-being at each wave.

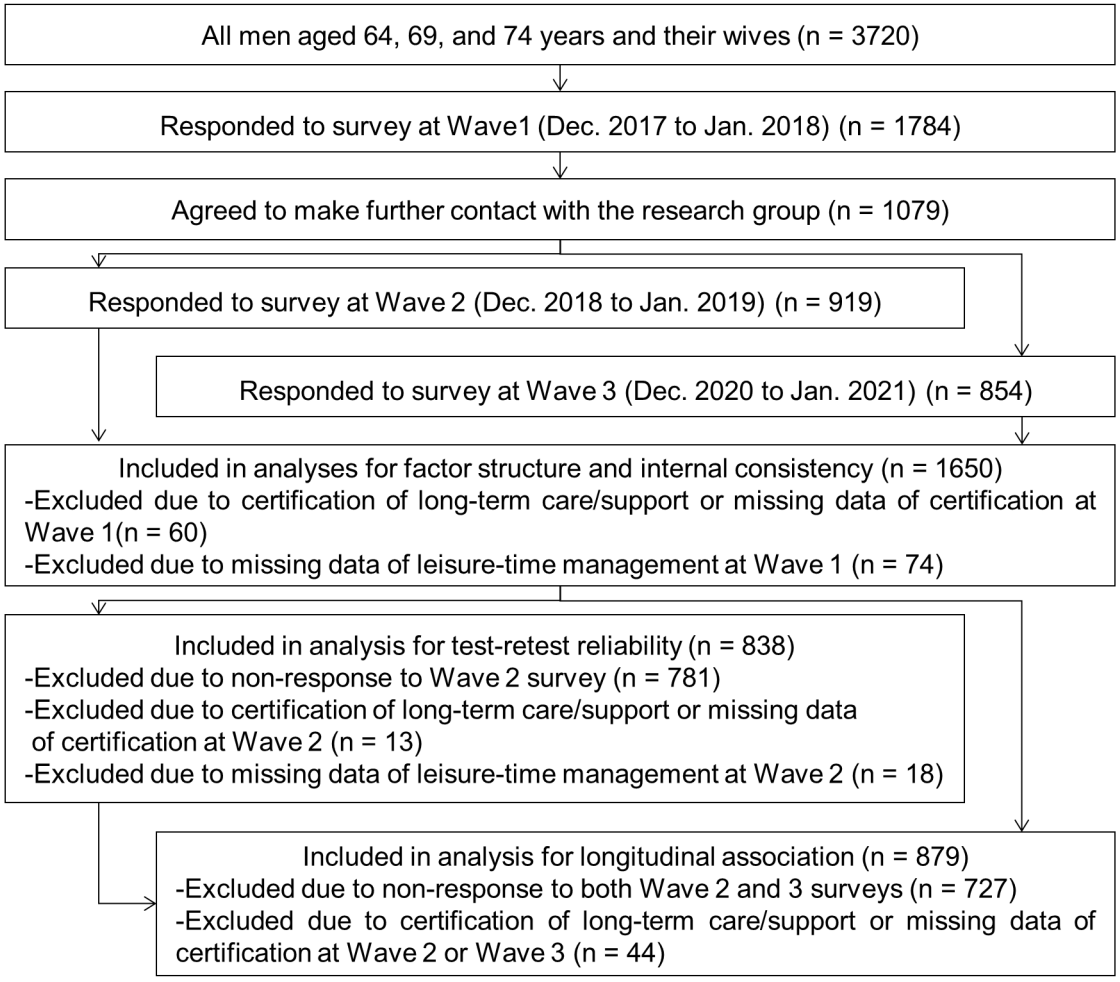
| | Wave 1 | | Wave 2 | | | Wave 3 | | |
|---|---|---|---|---|---|---|---|---|
| | n | M (SD) | n | M (SD) | p-value[a] | n | M (SD) | p-value[a] |
| Leisure-time management (score, 5 to 25) | 879 | 13.4 (4.4) | 813 | 13.4 (4.3) | 0.977 | 757 | 13.3 (4.2) | 0.101 |
| Subjective well-being (score, 0 to 15) | 877 | 9.6 (2.8) | 828 | **9.3 (2.7)** | **0.003** | 765 | **9.2 (2.7)** | **<0.001** |

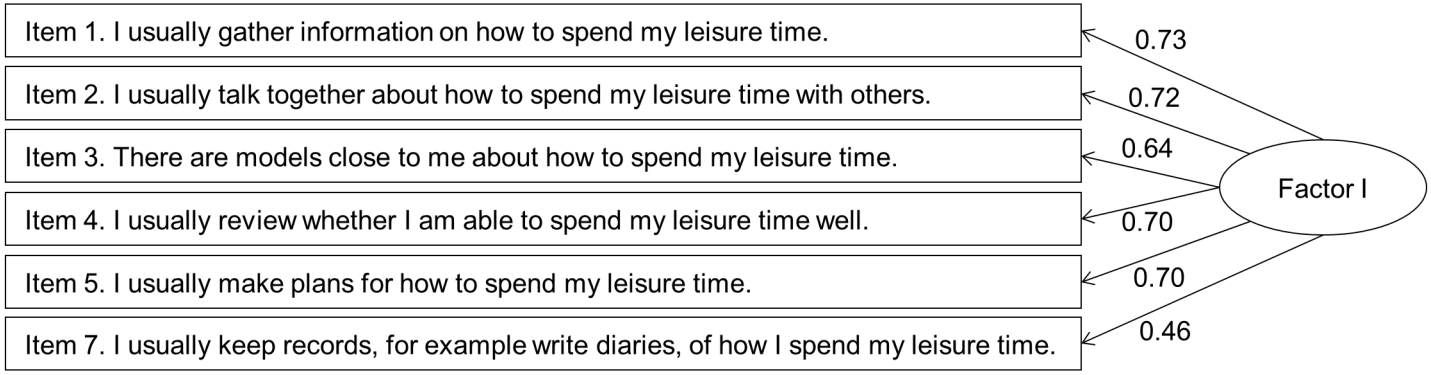
[a]Changes from Wave 1 estimated by a linear mixed model with setting variance of intercept as a random effect.
Values in bold indicate statistical significance ($p<0.05$).

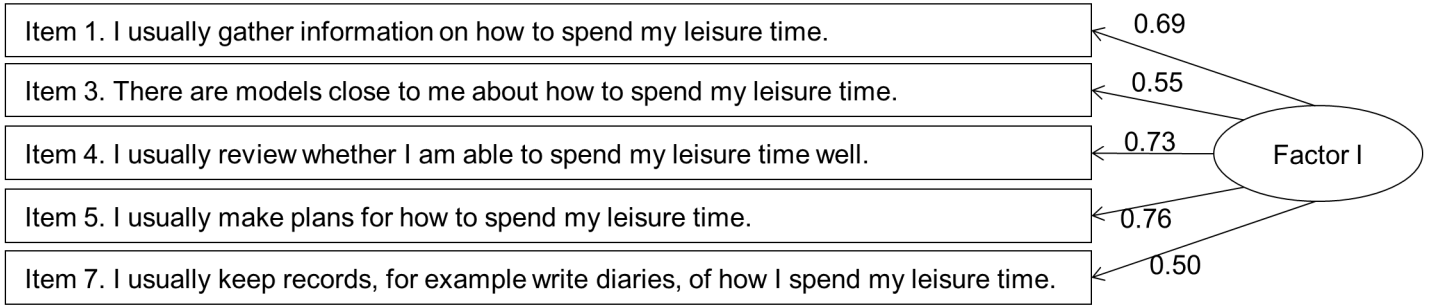
*Table 4*. Pearson's correlation coefficients for leisure-time management, subjective well-being, and demographic factors.

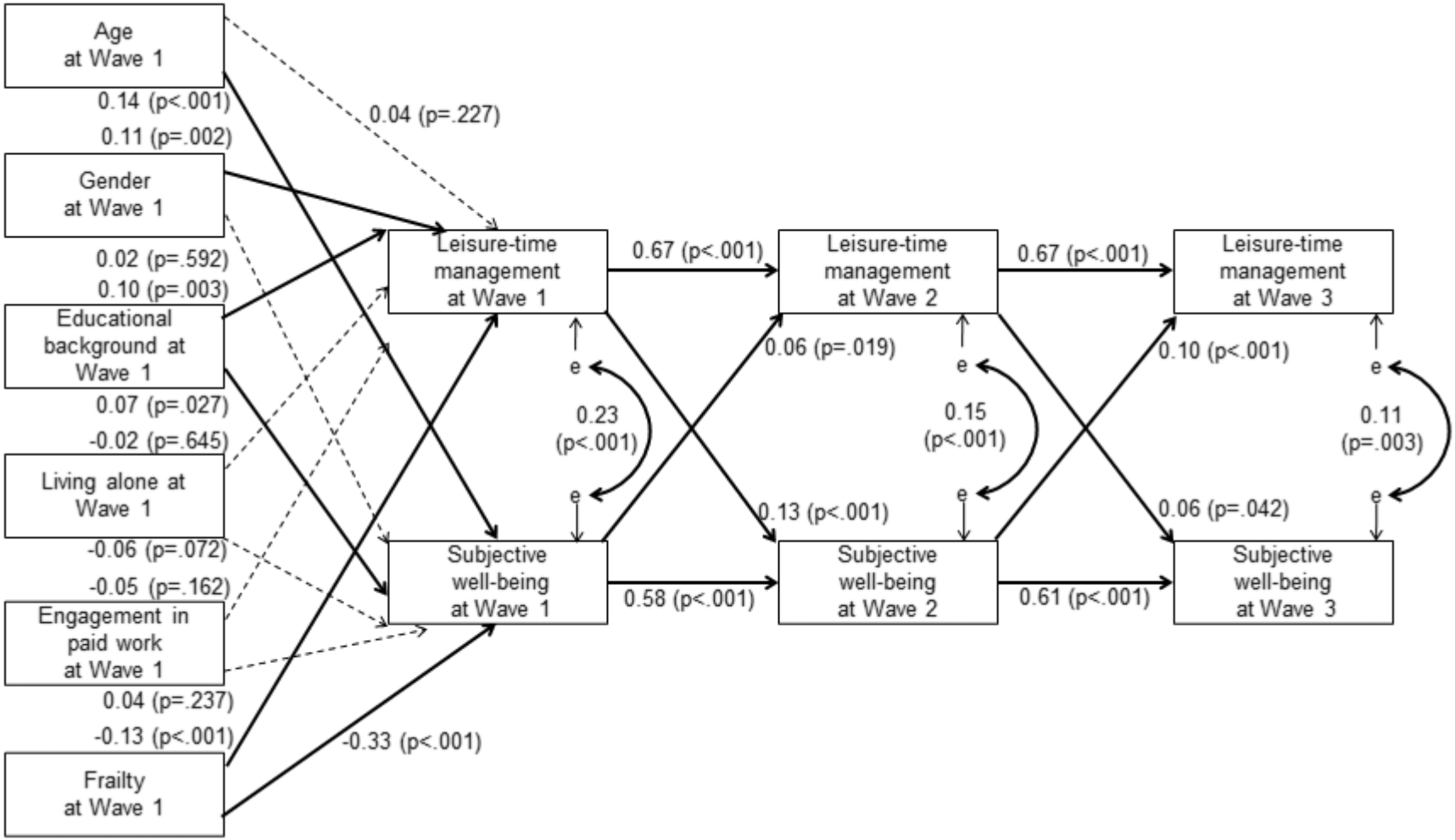
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Age at Wave 1 | | | | | | | | | | | |
| 2 Gender at Wave 1 | **-0.35 (p<0.001)** | | | | | | | | | | |
| 3 Educational background at Wave 1 | **-0.16 (p<0.001)** | -0.04 (p=0.230) | | | | | | | | | |
| 4 Living alone at Wave 1 | **0.08 (p=0.015)** | **-0.21 (p<0.001)** | **-0.07 (p=0.044)** | | | | | | | | |
| 5 Employment status at Wave 1 | **-0.18 (p<0.001)** | -0.04 (p=0.260) | 0.05 (p=0.193) | -0.02 (p=0.622) | | | | | | | |
| 6 Frailty at Wave 1 | **0.09 (p=0.011)** | **-0.09 (p=0.008)** | -0.05 (p=0.154) | **0.15 (p<0.001)** | **-0.08 (p=0.020)** | | | | | | |
| 7 Leisure-time management at Wave 1 | -0.02 (p=0.632) | **0.11 (p=0.001)** | **0.10 (p=0.005)** | -0.06 (p=0.069) | -0.05 (p=0.194) | **-0.14 (p<0.001)** | | | | | |
| 8 Subjective well-being at Wave 1 | **0.08 (p=0.019)** | 0.01 (p=0.829) | 0.07 (p=0.038) | **-0.11 (p=0.002)** | 0.04 (p=0.214) | **-0.33 (p<0.001)** | **0.26 (p<0.001)** | | | | |
| 9 Leisure-time management at Wave 2 | -0.06 (p=0.091) | 0.11 (p=0.002) | 0.17 (p<0.001) | -0.01 (p=0.689) | -0.03 (p=0.345) | **-0.13 (p<0.001)** | **0.68 (p<0.001)** | **0.24 (p<0.001)** | | | |
| 10 Subjective well-being at Wave 2 | **0.07 (p=0.038)** | **0.08 (p=0.023)** | 0.06 (p=0.081) | **-0.11 (p=0.002)** | -0.01 (p=0.728) | **-0.27 (p<0.001)** | **0.28 (p<0.001)** | **0.61 (p<0.001)** | **0.32 (p<0.001)** | | |
| 11 Leisure-time management at Wave 3 | -0.02 (p=0.485) | **0.09 (p=0.014)** | **0.12 (p=0.001)** | 0.01 (p=0.842) | -0.02 (p=0.512) | **-0.14 (p<0.001)** | **0.65 (p<0.001)** | **0.21 (p<0.001)** | **0.69 (p<0.001)** | **0.32 (p<0.001)** | |
| 12 Subjective well-being at Wave 3 | 0.01 (p=0.794) | 0.02 (p=0.512) | **0.09 (p=0.01)** | **-0.10 (p=0.006)** | 0.04 (p=0.259) | **-0.25 (p<0.001)** | **0.25 (p<0.001)** | **0.59 (p<0.001)** | **0.26 (p<0.001)** | **0.62 (p<0.001)** | **0.30 (p<0.001)** |

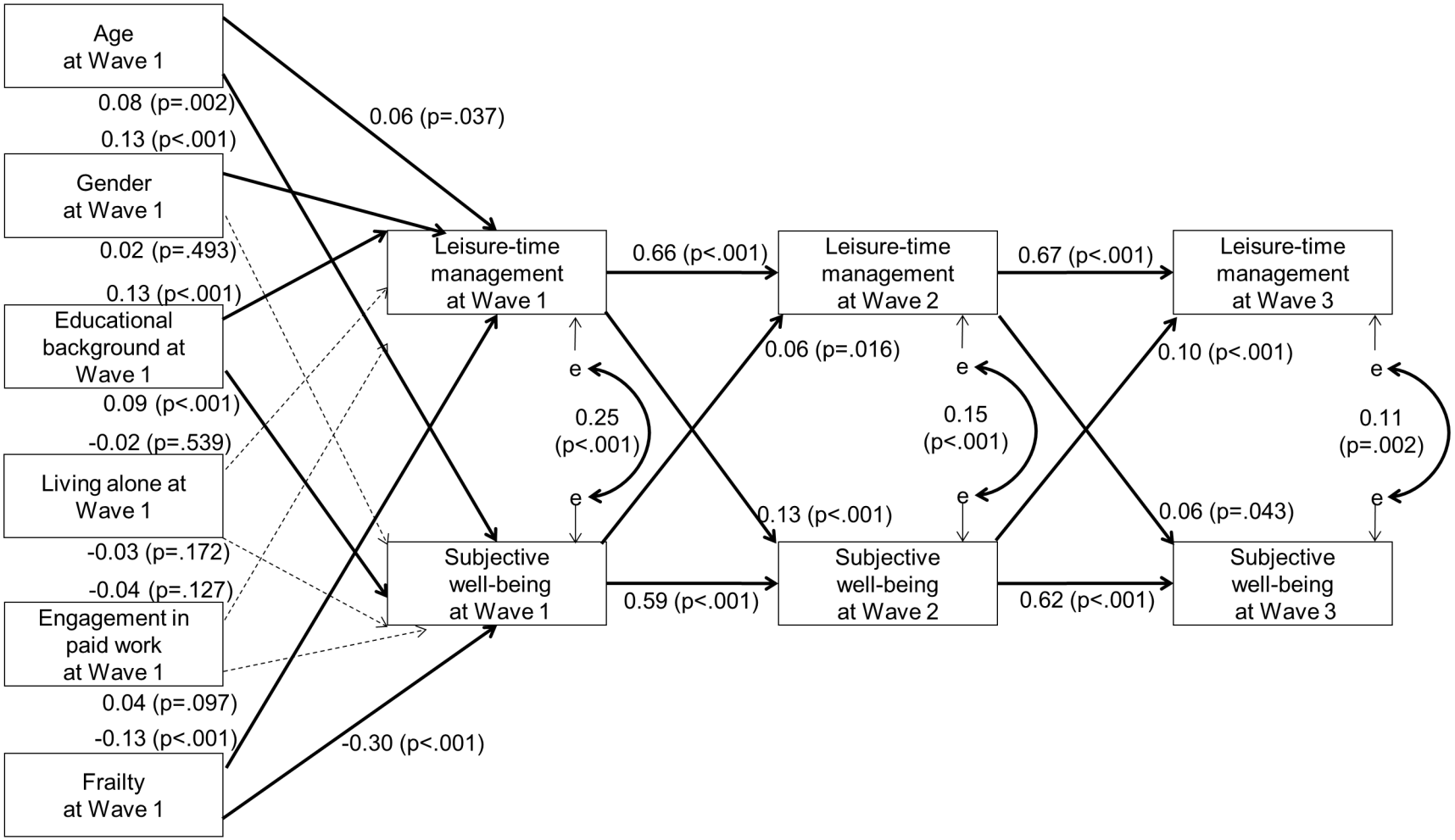
Values in bold indicate statistical significance (p<0.05). The multiple imputation method with the Markov chain Monte Carlo approach (30 datasets) were employed for missing values.


All men aged 64, 69, and 74 years and their wives (n = 3720)
Responded to survey at Wave1 (Dec. 2017 to Jan. 2018) (n = 1784)
Agreed to make further contact with the research group (n = 1079)
Responded to survey at Wave 2 (Dec. 2018 to Jan. 2019) (n = 919)
Responded to survey at Wave 3 (Dec. 2020 to Jan. 2021) (n = 854)
Included in analyses for factor structure and internal consistency (n = 1650)
-Excluded due to certification of long-term care/support or missing data of certification at Wave 1(n = 60)
-Excluded due to missing data of leisure-time management at Wave 1 (n = 74)
Included in analysis for test-retest reliability (n = 838)
-Excluded due to non-response to Wave 2 survey (n = 781)
-Excluded due to certification of long-term care/support or missing data of certification at Wave 2 (n = 13)
-Excluded due to missing data of leisure-time management at Wave 2 (n = 18)
Included in analysis for longitudinal association (n = 879)
-Excluded due to non-response to both Wave 2 and 3 surveys (n = 727)
-Excluded due to certification of long-term care/support or missing data of certification at Wave 2 or Wave 3 (n = 44)


Item 1. I usually gather information on how to spend my leisure time.
Item 2. I usually talk together about how to spend my leisure time with others.
Item 3. There are models close to me about how to spend my leisure time.
Item 4. I usually review whether I am able to spend my leisure time well.
Item 5. I usually make plans for how to spend my leisure time.
Item 7. I usually keep records, for example write diaries, of how I spend my leisure time.
0.73
0.72
0.64
0.70
0.70
0.46
Factor I


Item 1. I usually gather information on how to spend my leisure time.
Item 3. There are models close to me about how to spend my leisure time.
Item 4. I usually review whether I am able to spend my leisure time well.
Item 5. I usually make plans for how to spend my leisure time.
Item 7. I usually keep records, for example write diaries, of how I spend my leisure time.
0.69
0.55
0.73
0.76
0.50
Factor I


Age at Wave 1
Gender at Wave 1
Educational background at Wave 1
Living alone at Wave 1
Engagement in paid work at Wave 1
Frailty at Wave 1
Leisure-time management at Wave 1
Subjective well-being at Wave 1
Leisure-time management at Wave 2
Subjective well-being at Wave 2
Leisure-time management at Wave 3
Subjective well-being at Wave 3
0.14 (p<.001)
0.11 (p=.002)
0.02 (p=.592)
0.10 (p=.003)
0.07 (p=.027)
-0.02 (p=.645)
-0.06 (p=.072)
-0.05 (p=.162)
0.04 (p=.237)
-0.13 (p<.001)
0.04 (p=.227)
-0.33 (p<.001)
0.67 (p<.001)
0.58 (p<.001)
0.67 (p<.001)
0.61 (p<.001)
0.06 (p=.019)
0.13 (p<.001)
0.10 (p<.001)
0.06 (p=.042)
e
0.23 (p<.001)
0.15 (p<.001)
0.11 (p=.003)


Age at Wave 1
Gender at Wave 1
Educational background at Wave 1
Living alone at Wave 1
Engagement in paid work at Wave 1
Frailty at Wave 1
0.08 (p=.002)
0.13 (p<.001)
0.02 (p=.493)
0.13 (p<.001)
0.09 (p<.001)
-0.02 (p=.539)
-0.03 (p=.172)
-0.04 (p=.127)
0.04 (p=.097)
-0.13 (p<.001)
0.06 (p=.037)
-0.30 (p<.001)
Leisure-time management at Wave 1
Subjective well-being at Wave 1
0.66 (p<.001)
0.59 (p<.001)
Leisure-time management at Wave 2
Subjective well-being at Wave 2
0.67 (p<.001)
0.62 (p<.001)
Leisure-time management at Wave 3
Subjective well-being at Wave 3
0.06 (p=.016)
0.13 (p<.001)
0.10 (p<.001)
0.06 (p=.043)
e
0.25 (p<.001)
e
e
0.15 (p<.001)
e
e
0.11 (p=.002)
e