Effect of achievement motive on purpose in life, social participation, role expectation, self-efficacy, and physical function by a longitudinal research study in Japan: using multilevel structural equation modeling

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22 **Key words:** Achievement motive, Multilevel structural equation modeling, Rehabilitation,

23 Community-dwelling elderly people

24

25 **Abstract**

26 **Objective:** The purpose of this study was to demonstrate the effects of the achievement

27 motive on important variables such as the purpose in life and social participation with

28 objective physical functions in predicting within-person fluctuations and between-person

29 differences using longitudinal research in community-dwelling Japanese elderly people.

30 **Methods:** The final dataset consisted of 227 persons (men: 109, women: 118) from

31 day-service centers through testing at three time points. The tests comprised a questionnaire

32 on the achievement motive, purpose in life and so on and the measurement of physical

33 functions. We verified the following hypothesis model; 1) achievement motive works on

34 improvement of the purpose in life, social participation, self-efficacy, and role expectation, 2)

social participation and role expectation improve the purpose in life, 3) hobbies and going out affect the purpose in life, 4) social participation and physical function affect the increase in going out, 5) achievement motive and social participation improve physical function and increase role expectation and hobbies, and 6) self-efficacy improves social participation and the purpose in life. Our hypothesized model was based on previous research and was analyzed using a multilevel structural equation modeling approach.

Results: The modified hypothesis model without hobby, grip strength, and gait speed exhibited an adequate model fit: comparative fit index = 0.904, Tucker-Lewis index = 0.775, root mean square error of approximation = 0.064, Akaike's information criterion = 25201.17, Bayesian information criterion = 25389.59, and adjusted BIC = 25256.24. Within level, the achievement motive had significant direct effects on the purpose in life, social participation, and self-efficacy. In addition, there were significant indirect effects of the achievement motive on the purpose in life through social participation and on social participation through self-efficacy. Between level, the achievement motive had significant direct effects on all variables and significant indirect effects on the purpose in life, social participation, and going out.

Conclusion: Our findings highlight the implications of achievement motive for the purpose in

life, social participation and self-efficacy of the participation at the within person and between people levels. Consequently, we understood that the achievement motive could strongly affect between-person differences more than within-person fluctuations during a short period of six months.

Introduction

In Japan, the percentage of elderly people who are aged 65 years or over in the total population was 26.7% in 2015, and is expected to increases by more than 30% by 2035 (Cabinet Office, 2017). Accordingly, it is very important to extend healthy life expectancy (i.e., the number of years of life that are expected to be lived in full health), to expand health-related quality of life (QOL) for the elderly, and to reduce the enormous expenditures of the national medical and the long-term care benefit (i.e., care prevention). Care prevention is defined as "preventing (delaying) as much as the possible conditions that require nursing care, preventing worsening of the conditions even if an elderly person currently requires as much care as possible, and trying to mitigate such conditions" (Ministry of Health, Labour and Welfare, 2012; Wada et al., 2015). It is also explained as "trying to improve QOL by improving life functions (activity level) and participation (role level) of individual elderly people and supporting individual purposes of life and efforts towards self-actualization through improvement of mental and physical functions, environmental adjustment, and so forth instead of only trying to improve individual elements such as the motor functions and nutritional conditions in the elderly" (Ministry of Health, Labour and Welfare, 2012; Wada et al., 2015). Therefore, rehabilitation of the elderly is necessity for maintaining or improving

not only mental and physical functions, but also activity and role levels, and providing intervention and support to motivate them is expected (Miyata, 2015; Tsuruta, 2015).

A number of studies have addressed the motivation of individual as an important part of rehabilitation, and the achievement motive is a significant concept concerning client goal assessment and intervention (Lampton et al., 1993; Resnick, 1996; Resnick et al., 2002; Vanetzian, 1997). In Japan, Achievement motive is measured by an achievement motivation scale with two psychometric factors: (1) self-fulfillment achievement motivation directed at pursuing goals evaluated by one's own standards of achievement regardless of the values of others or society; (2) competitive achievement motivation directed at seeking social prestige by defeating others and achieving better results than they achieve (Horino, 1987; Horino & Mori, 1991; Takeuchi et al., 2014). However, we report that the scale is inadequate for persons with disabilities because it is unlikely that they seek the social prestige of defeating others. In fact, our previous study showed that the competitive achievement motivation scores of people using rehabilitation service was significantly lower when compared with those of healthy people and that factor analysis result were different from the original two-factor structure (Sano, 2013). Therefore, we have operationally defined the achievement motive as the intention to achieve one's goals while maintaining a standard of excellence and have

developed the Scale for Achievement Motive in Rehabilitation (SAMR) in order to assess 手 the achievement motive in clients adequately. The validity and the reliability of SAMR has been demonstrated in our previous studies, it consists of a unique two-factor structure: (1) self-mastery-derived achievement motive, which refers to making an effort to enhance one's own abilities and intelligence; (2) means/process-oriented achievement motive, which emphasizes the willingness to follow a rehabilitation program to achieve one's goals (Sano & Kyougoku, 2015; Sano et al., 2014).

We have previously demonstrated that the achievement motive affects various variables such as the health-related QOL, purpose in life, social participation, role expectation, self-efficacy, and hopelessness in community-dwelling elderly people (Sano & Kyougoku, 2016a; Sano & Kyougoku, 2016b; Sano et al., 2015). These results suggest that enhancing the intention to achieve one's goals enables clients in rehabilitation to improve states involved in life functions and participation and prevents them from failing to meet their goals and subsequently abandoning their goals. Other studies have also demonstrated that health-related QOL and well-being as outcomes for elderly people have positive correlations with social participation, physical function, gait ability, social role, and so on (e.g. Garatachea, 2009; Imai & Saito, 2011; Martin et al, 2001; Shimada et al., 2006). Moreover, the several studies

have reported that daily life activities and motor/cognitive functions in elderly people are improved through care prevention projects such as physical exercise, machine training, and the dementia prevention programs (e.g. Kamegaya & Yamaguchi, 2016; Suita et al., 2011; Wada et al., 2015). To summarize, it is presumed that better states of physical function, gait ability, and social participation has tend to make elderly people have better healthy life expectancy and health-related QOL, and the achievement motive contributes to this.

Nevertheless, our previous studies about the achievement motive were cross-sectional studies and indicated structural relationships among the investigated variables and general trends in the study population. What is more, the latent variables used in our studies, such as the achievement motive, health-related QOL, and purpose in life were based on subjective evaluation via self-reported questionnaires. Although individual intervention and support are expected to bring about desirable changes in rehabilitation clients, it remains unclear as to how the achievement motive affects various outcomes of objective physical functions by within-person fluctuations and causal relationships through longitudinal research. Therefore, the purpose of this study was to demonstrate the effects of the achievement motive on the purpose in life, social participation, self-efficacy, role expectation, hobbies, and physical function in predicting within-person fluctuations and between-person differences by

longitudinal research in community-dwelling elderly people.

We devised our hypothesized model (Figure 1) based on previous research. First, in accordance with previous studies, we assumed that the achievement motive works on improvement of the purpose in life, social participation, self-efficacy, and role expectation (Sano & Kyougoku, 2016a; Sano & Kyougoku, 2016b; Sano et al., 2015). Similarly, we assumed that social participation and role expectation work improve the purpose in life (Imai, 2013; Sano N, Kyougoku M. 2016a). In addition, the possibility that hobbies and going out affect the purpose in life was examined. Next, we assumed that social participation and physical function affect the increase in going out by reference to research on social participation and gait ability promoting going out (Sano N, Kyougoku M. 2016c). We also assumed that the achievement motive and social participation improve physical function and increase role expectation and hobbies, because good motivation and social participation promote activity and regular habits. Moreover, we conjectured that self-efficacy improves social participation and the purpose in life by due confidence and opportunity for practical action.

Methods

141 **Ethics statement**

142 This study was of a longitudinal research design. Data collection conformed to the
143 Declaration of Helsinki and the policies of the Ethics Committee of Kibi International
144 University (No. 13–34). In addition, we obtained approval from the facility directors of the
145 institutions that cooperated in this study. Participants had the right to withdraw from the study
146 at any time regardless of reasons. They indicated informed consent by completing
147 questionnaires and placing them in a box or submitting them to the study staff.

148

149 **Participants**

150 Participants included community-dwelling elderly people from day-service centers.
151 Subjects were excluded if they had been diagnosed with a mental disorder, such as
152 schizophrenia and dementia, if they had demonstrated clear decline in cognitive function due
153 to a mental disorder or neuropsychological deficit, or if they were unable to read or write on
154 the questionnaire.

155

156 **General procedure**

157 The longitudinal data in this study were collected from March to December in 2014.

158 Participants were tested at the three time points: initial occasion, three months later, and six
159 months later. Participants answered the questionnaires and physical functions were measured
160 at each time point by the corresponding author or the staff of the institutions that cooperated
161 in this study.
162
163 **Questionnaires**
164 ***1) Demographic information***
165 The questionnaire covered the following demographic information: gender, age,
166 primary illness or disease, nursing care level (needing care: 1–5, needing support: 1–2, or
167 nothing), number of times the person went out each week (going out), and hobbies in which
168 the person participated.
169 ***2）Achievement motive***
170 The SAMR was used to assess participants' achievement motive (Sano &
171 Kyougoku, 2015; Sano et al., 2014). The SAMR has 10 self-rating items (e.g., "I think that I
172 can overcome any difficulty to achieve my goal"), which respondents answer on a 7-point
173 Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The SAMR is based on a
174 two-factor solution structure: self-mastery derived factor and means/process-oriented derived

175 factor. Total scores of the SAMR can be converted to a standardized score and a higher
176 standardized score represents a stronger achievement motive.

177 ***3）Social participation***

178 The self-completed occupational index (SOPI) was used to assess social
179 participation (Imai & Saito. 2010). The SOPI has 9 self-rating items (e.g., ‘‘Have you been
180 able to perform important leisure activities in the past month?”), which respondents answer on
181 a 5-point Likert scale ranging from 1 (I hardly have been satisfied) to 5 (I have been very
182 satisfied). The SOPI is based on an oblique three-factor model: leisure, productivity, and
183 self-care. Summary score was calculated using following equation: (total score of 9 items −
184 9)/36 × 100. A higher summary score represents better social participation.

185 ***4）Purpose in life***

186 The K-1 scale for the feeling that life is worth living among the aged (K-1 scale)
187 was used to assess participants’ purpose in life (Kondo, 2007). The K-1 scale has 16
188 self-rating items (e.g., ‘‘I feel something to realize my accomplishment’’), which respondents
189 answer on a 3-point Likert scale ranging from 0 (no) to 2 (yes). The K-1 scale is based on an
190 oblique four-factor model: self-realization and will, sense of life fulfillment, will to live, and
191 sense of existence. We reverse scored item 2, 4, 9, and 12 so that an agreement with the item

represented a low level of purpose in life. A higher total score of the K-1 scale represents a better purpose in life.

5）Self-efficacy

The general self-efficacy scale (GSES) was used to assess participants' self-efficacy (Sakano, 1989). The GSES has 16 self-rating items (e.g., "I work on anything positively"), which respondents answer on a 2-point Likert scale ranging from 0 (no) or 1 (yes). The GSES is based on a three-factor model structure: behavioral positivity, anxiety for failure, and social position of capacity. We reverse scored item 2, 4, 5, 7, 8, 11, 14, and 15 so that agreement with these items represented a low level of self-efficacy. A higher total score of the GSES represents a better self-efficacy.

6）Role expectation

A multiple-choice form was used to assess participants' role expectation. We provided 11 items with reference to a role checklist: volunteer, caregiver, housework, friend, family member, religionist, hobbyist or amateur, participant in an organization, student, worker, and other (Kielhofner, 2007). Participants selected roles that were applicable to them and the total number of chosen roles was counted.

209 **Physical functions**

210 This study implemented grip strength, gait speed, and timed up & go test (TUG) as
211 physical functions. Grip strength was measured two times with each hand, using a digital or
212 analog Smedley dynamometer in the standing or sitting position with shoulder adduction and
213 neutral rotation and full extension of the elbow (Otsuka, 1994). Results were recorded as the
214 mean of two trials in the stronger hand in kilograms. Gait speed was measured once in a tenth
215 of a second with a stopwatch over the middle 10 meters of a 16-meters walkway to minimize
216 the effects of acceleration and deceleration (Dean et al., 2001; Tozato, 2003). Subjects were
217 instructed to walk as fast as they could safely walk and were able to use assistive devices such
218 as a T-cane or walker. The TUG was measured twice in a tenth of a second with a stopwatch
219 as the time taken for a subject to stand up from an armchair, walk a distance of 3 meters, turn
220 on a marker, walk back to the chair, and sit down (Podsiadlo & Richardson, 1991;
221 Shumway-Cooket al., 2000). Subjects were instructed on walking pace and assistive devices
222 in the same way as for gait speed. Results were recorded as the mean of two trials.

223

224 **Statistical analyses**

225 Descriptive statistics were obtained and normality testing was conducted using

SPSS Statistics version 22 (www-01.ibm.com/software/jp/analytics/spss/products/statistics/). Multilevel correlation analysis and participant reliability between/within levels were conducted using HAD12 (http://norimune.net/had). Multilevel structural equation modeling (MLSEM) was conducted using Mplus version 7.2 (www.statmodel.com).

1) Descriptive statistics and test of normality

To observe the overall patterns, the number of answers and response frequencies (%) for each choice on demographic information on the initial occasion were examined. In addition, for total scores or the summary score on each scale and physical function, descriptive statistics were calculated, including mean, standard deviation (SD), skewness, kurtosis, and normality using the Kolmogorov–Smirnov test at the three time points.

2) Multilevel correlation analysis between variables

Multilevel analysis deals with the analysis of multilevel data such as the trio of collected data on each occasion nested within participants in this study and attempts to partition observed variance into within and between-clusters components (Shimizu, 2014). On analyzing this data, we took the multilevel data structure into account with the trio of data (within level) nested within participants (between level).

To identify the different within level and between level correlations, we performed

multilevel correlation analysis among demographic information, total or summary scores on each scale, and physical functions. Values of >0.2 and <0.4 indicated weak correlation, those of >0.4 and <0.7 indicated moderate correlation, and those of >0.7 and <0.9 indicated strong correlation.

3) Causal relationship using MLSEM approach

To determine whether the trio of collected data within an individual was a reliable indicators of the respective between level construct, we confirmed the reliability of participants between/within levels by calculating the P values of within-class variance and between-class variance, the intra-class correlations coefficient type 1 (ICC1) and type 2 (ICC2), and design effect (DEFF) (Bliese, 2000; Shimizu, 2014; Snijders & Bosker, 1999). ICC1 and ICC2 are based on a one-way analysis of variance with random effects. In the present case, the trio of collected data within an individual constitutes the dependent variables and the independent variable lies between level is. ICC1 was calculated to make sure enough between level variance was available to warrant decomposing within level and between level variance (Hoffman & Stawski, 2009; Preacher et al., 2010). ICC2 was calculated to provide an estimate of the reliability of the class-mean rating (Bliese PD. 2000; Shimizu, 2014). DEFF was calculated as a value for correct weighting of the sample size of the group (in this

study, number of measurements for an individual) for ICC1 (Shimizu, 2014). The reliability of participants at the between/within levels set the standard values: P values of within-class variance and between-class variance are <0.05, ICC1 >0.2, ICC2 >0.7 (<0.6 may issue an estimator bias), and DEFF >2.0 are desirable (Bliese, 2000; Preacher et al., 2010; Shimizu, 2014).

The MSEM approach takes advantage of both multilevel modeling (MLM), the statistical model of parameters that vary at more than one level, and SEM, a single variable that can be both a predictor and an outcome, features in modeling longitudinal data (Preacher et al., 2010; Shimizu, 2014). The TWOLEVEL option was used in order to model random intercepts and fixed slopes using the multilevel framework (Muthén & Muthén, 2012). Given that a trio data of individuals were used, we employed cluster identifiers to account for dependency among sample participants. The hypothetical model was analyzed using multiple indicator multiple cause (MIMIC) and an MLSEM approach. We used the maximum likelihood with robust standard errors (MLR) with missing data and referred to several fit indices: comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), Akaike's information criterion (AIC), Bayesian information criterion (BIC), and sample size-adjusted BIC. CFI and TLI values greater than 0.9 indicate

277 the best model fit. For RMSEA, values ≤0.05 indicate a close fit, ≤0.08 indicate a reasonable
278 fit, and those ≥0.1 indicate a poor fit (Hu & Bentler, 1999; MacCallum et al., 1996). For AIC,
279 BIC, and sample size-adjusted BIC as the comparative indices, lower values of these three
280 indices represent better model fit and are used to compare the best fitting model by choosing
281 the model with the smallest value. We estimated the standardized path coefficients of direct
282 effect and indirect effect, each with 95% confidence interval (CI). The adjusted R-square (R^2)
283 is provided based on observation variables in the perceived path, indicating which percentage
284 of the variance in these variables is explained by the combination of the intercept and slope.
285
286 **Results**
287 **1) Participant characteristics**
288 We recruited a total of 284 participants from 9 facilities on the initial occasion. The
289 final sample consisted of 227 individuals, 109 (48.0%) men and 118 (52.0%) women, and the
290 mean age was 77.1 ± 8.6 years on the initial occasion. Individuals who withdraw from this
291 study or stopped using the facilities due to hospitalization, removal, or death (n = 57) were
292 excluded from the analyses presented in this manuscript (rate of attrition: 20.1%). Details of
293 the participant characteristics are presented in Table 1.

2) Descriptive statistics and test of normality

Descriptive statistics for total scores or the summary score on each scale and physical functions on each occasion are shown in Table 2. The tests of normality indicated that the total score of SAMR on the second occasion and the summary score on the third occasion held the normalization data. For going out, role expectation, hobby, gait speed, and TUG, high values were indicated in the skewnes and kurtosis with a Poisson distribution. The other variables were found to be non-normal according to the tests of normality; however, there were no extreme deviations in mean, SD, skewnes, and kurtosis.

3) Multilevel correlation analysis between variables

Multilevel correlation analysis indicated that there were different correlations within level and between level (Table 3). Bivariable correlation within level revealed significant positive correlations among the K-1 scale, SAMR, SOPI, and GSES, and a significant positive correlation between TUG and gait speed. In addition, there was a significant negative correlation between grip strength and TUG. Meanwhile, bivariable correlation between level revealed that there were significant positive correlations among almost all variables without physical functions, and a significant positive correlation between GSES and grip strength. In particular, TUG had a strong positive association with gait speed

311 and a negative association with role expectation and going out.

312 **4) Causal relationship using MLSEM approach**

313 To begin with the reliability of participants between/within levels, hobby deviated
314 from both the P values of within-class and between-class variance. Although role expectation
315 did not meet the standard values for ICC1 and DEFF, we decided to determine whether role
316 expectation must be excluded in consideration of the result of the MLSEM. The other
317 variables had met the standard ranging (Table 4). Accordingly, direct and indirect effects both
318 within and between levels of the MLSEM approach were simultaneously estimated.

319 Figure 2 demonstrates the results of the MLSEM approach based on the
320 hypothesized model. The fit indices of the hypothesized model without hobby were not an
321 adequate fit level: CFI = 0.742, TLI = 0.420, RMSEA = 0.073, AIC = 31933.48, BIC =
322 32220.59, and adjusted BIC = 32017.39. In addition, both within level and between level,
323 there were insignificant path coefficient estimates based on the hypothesized model; in
324 particular, physical functions had the most insignificant paths. Therefore, these variables and
325 paths without statistical relationships in either within level or between level were eliminated
326 sequentially and the modified model was run again with the SEM approach in reference to the
327 fit indices. Consequently, the fit indices of the modified model exhibited an adequate fit: CFI

= 0.904, TLI = 0.775, RMSEA = 0.064, AIC = 25201.17, BIC = 25389.59, and adjusted BIC = 25256.24 (Figure 3). The direct effects and the indirect effects in the modified model can be seen in Table 5.

In the within level results of the modified model, SAMR had statistically significant effects on the K-1 scale, SOPI, and GSES. Moreover, the effect of SOPI on the K-1 scale and the effect of GSES on SOPI were statistically significant. For indirect effects, the sum of the effects of SAMR on the K-1 scale through role and SOPI, and the effect of SAMR on SOPI through GSES were found to be significant. Meanwhile, between level of the modified model, SAMR had statistically significant effects on all variables. SOPI also had statistically significant effects on the K-1 scale, role, and going out. Moreover, the effects of GSES on SOPI, the effect of role on the K-1 scale, and the effect of TUG on going out were statistically significant. For indirect between level effects, the sum of the effects of SAMR on the K-1 scale through role and SOPI, and the effect of SAMR on SOPI through GSES were found to be significant.

The within level results of the modified model were $R^2 = 0.167$ for the K-1 scale, $R^2 = 0.096$ for SOPI, $R^2 = 0.092$ for GSES, $R^2 = 0.009$ for role, $R^2 = 0.000$ for TUG, and $R^2 = 0.003$ for going out. The between level results of the modified model were $R^2 = 0.521$ for the

K-1 scale, $R^2 = 0.394$ for SOPI, $R^2 = 0.177$ for GSES, $R^2 = 0.292$ for role, $R^2 = 0.044$ for TUG, and $R^2 = 0.130$ for going out.

Discussion

The purpose of this study was to demonstrate the effects of the achievement motive on the purpose in life, social participation, role expectation, self-efficacy, and physical function in predicting within-person fluctuations and between-person differences by longitudinal research in community-dwelling elderly people. Accordingly, we hypothesized that the achievement motive and other variables have relationships with direct or indirect effects within level and between level. We performed the longitudinal research over six months in the participants. The findings partly supported our hypothesis in the modified model without hobby, grip strength, and gait speed. It was demonstrated that the achievement motive had a significant effect on the purpose in life, social participation, and self-efficacy in both of within-person fluctuations and between-person differences. Especially for the between level result, the effect size of the achievement motive was higher than that within level and the achievement motive also had significant effects on role expectation and gait ability as measured by TUG.

For the reliability of participants according to P values, ICC1, ICC2, and DEFF, we put role expectation on hold and excluded hobby. Role expectation was applied in the MLSEM approach because there were relevant values through the fit indices and path coefficients of MLSEM. The results was presented that the dataset of this study is seemed appropriate to be treated as a trio nested within participants. In addition, the result of the modified model using the MLSEM approach showed that CFI and RMSEA were good fit statistics, and AIC, BIC, and adjusted BIC were smaller than that of the hypothesized model without hobby. Consequently, we concluded that the modified model was an adequate model in this study.

Within level, the higher state of achievement motive in within-person fluctuations had a tendency to get better with the state of the purpose in life, social participation, and self-efficacy. Furthermore, the result presented the slight possibility that the state of social participation and role expectation improved by the achievement motive leads the state of the purpose in life well and that the state of self-efficacy improved by the achievement motive leads the state of social participation well. That is, we suggested that the objective notion, such as a meaning from life's experiences and possessing a sense of intentionality, recognizing engagement in important activities for oneself, and a belief in their capability to

379 organize and execute actions, would be fulfilled while individuals enhanced their desire to
380 achieve their personal goals.

381 Between level, a stronger achievement motive tended to enhance the purpose in life,
382 social participation, and self-efficacy similar to that observed within level. Moreover, the
383 achievement motive has favorable effects on role expectation and walking ability. This study
384 demonstrated new findings that pursuing client goals to maintain a standard of excellence
385 could improve balance and ability and reduce the risk of falling related to walking as a
386 physical function. Furthermore, the result presented the significant mediators that a better
387 condition of social participation, role expectation, self-efficacy, and walking ability promoted
388 by the achievement motive leads an individual to enhance the purpose in life, going out, and
389 social participation. In other words, the stronger the achievement motive of individuals, the
390 more they tend to increase going out because of improvement in the walking ability in
391 addition to fulfillment of the objective notion.

392 These results demonstrated that rehabilitation support based on establishing and
393 pursuing client goals while maintaining a standard of excellence could promote meaningful
394 outcomes, such as the purpose in life, social participation, and going out, for
395 community-dwelling elderly people. Although the total score and the summary score of scales

were used in the study analysis, the variables and the path coefficients indicated that the achievement motive's affects were consistent with our previous cross-sectional studies (Sano & Kyougoku, 2016a; Sano & Kyougoku, 2016b; Sano & Kyougoku, 2016c; Sano et al., 2015). Therefore, we concluded that the causal relationship of the achievement motive in elderly persons having favorable effects on the purpose in life, social participation, role expectation, and self-efficacy has been established by this longitudinal design research that was conducted over a period of six months. In addition, it was revealed that there are some different effects from within level and between level. For within-person fluctuations, it is considered that a long period is necessary for changes in objective outcomes, such as physical function, regular habits, and role accomplishment. In sum, we understood that the effects of the achievement motive could strongly affect between-person differences more than within-person fluctuations in as short a period as six months.

Limitations and future research directions

Regarding the content of our study, there are several limitations. First, the sampling in this study only consisted of persons using adult day services in non-random selection areas. In addition, because it was impossible to carry out the same timing for all three occasions

413 with the same rater, measurement errors due to the point of data collection and the rater in
414 physical function testing should be noted. However, any rater bias we dealt with by using and
415 sharing standardized indices of measurement methods such as grip strength, gait speed, and
416 TUG (Otsuka, 1994; Podsiadlo & Richardson, 1991; Tozato, 2003). Given these
417 considerations, it would be useful in future studies to establish a program for raising the
418 achievement motive of individuals and to examine the effect of particular interventions
419 selected on the basis of this and of previous study findings.
420

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425

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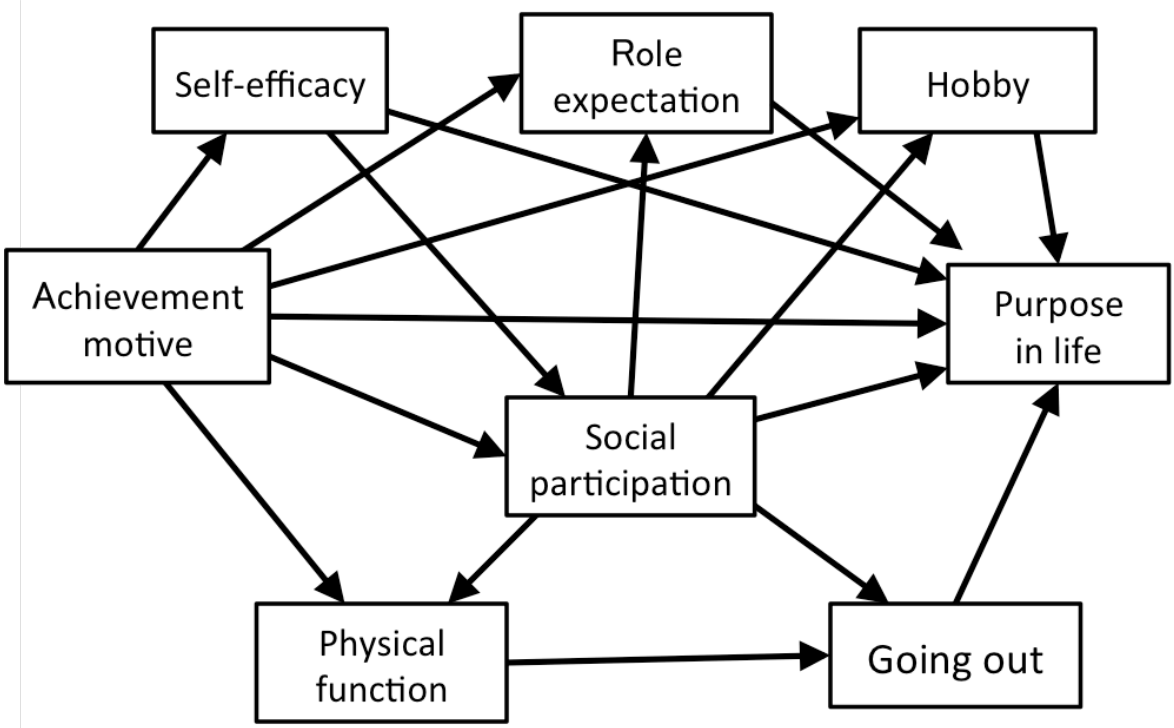


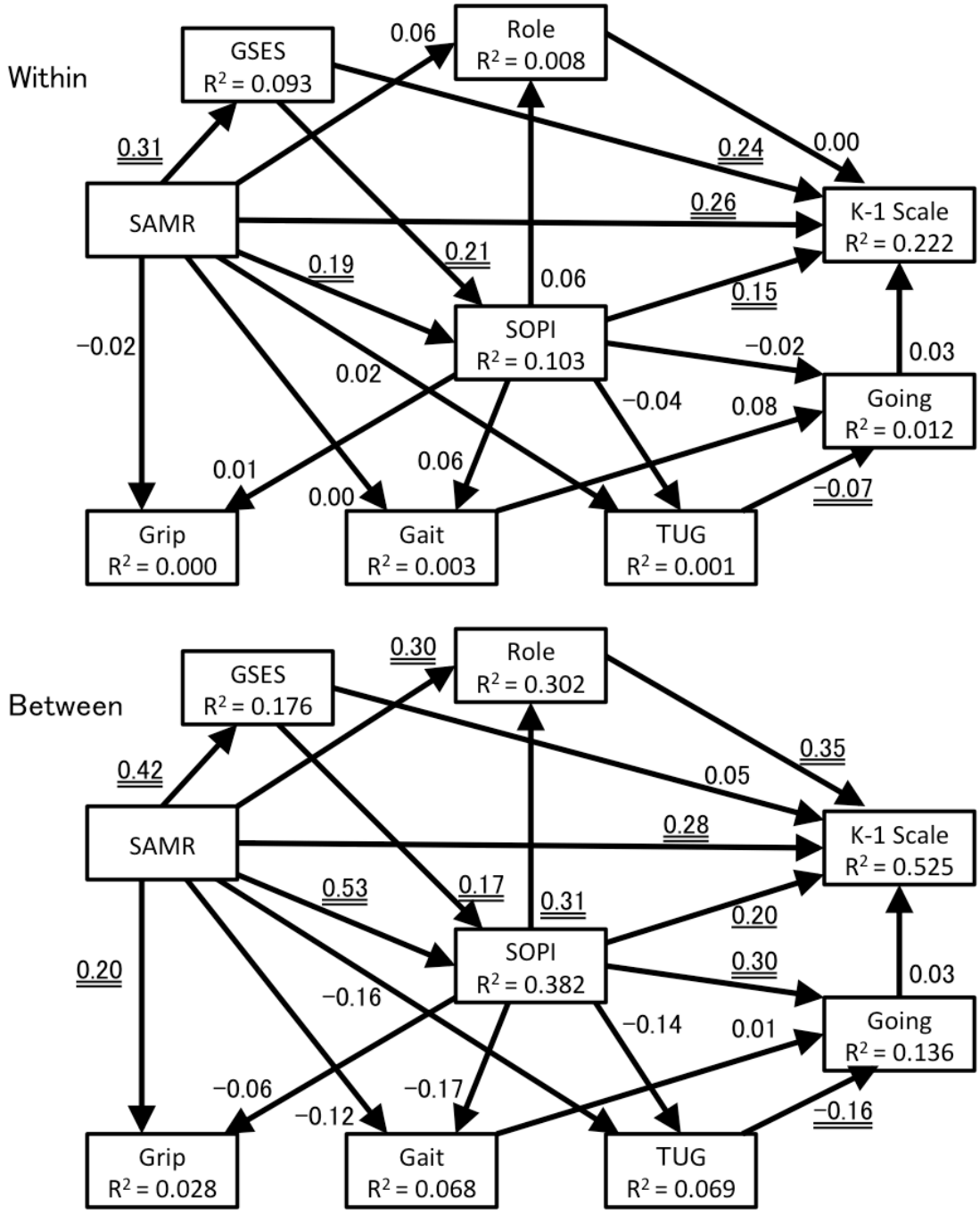
549

550 **Figure 1. Hypothesized model**

551 **Note.**

552 A rectangle represents an observed variable.

553



554

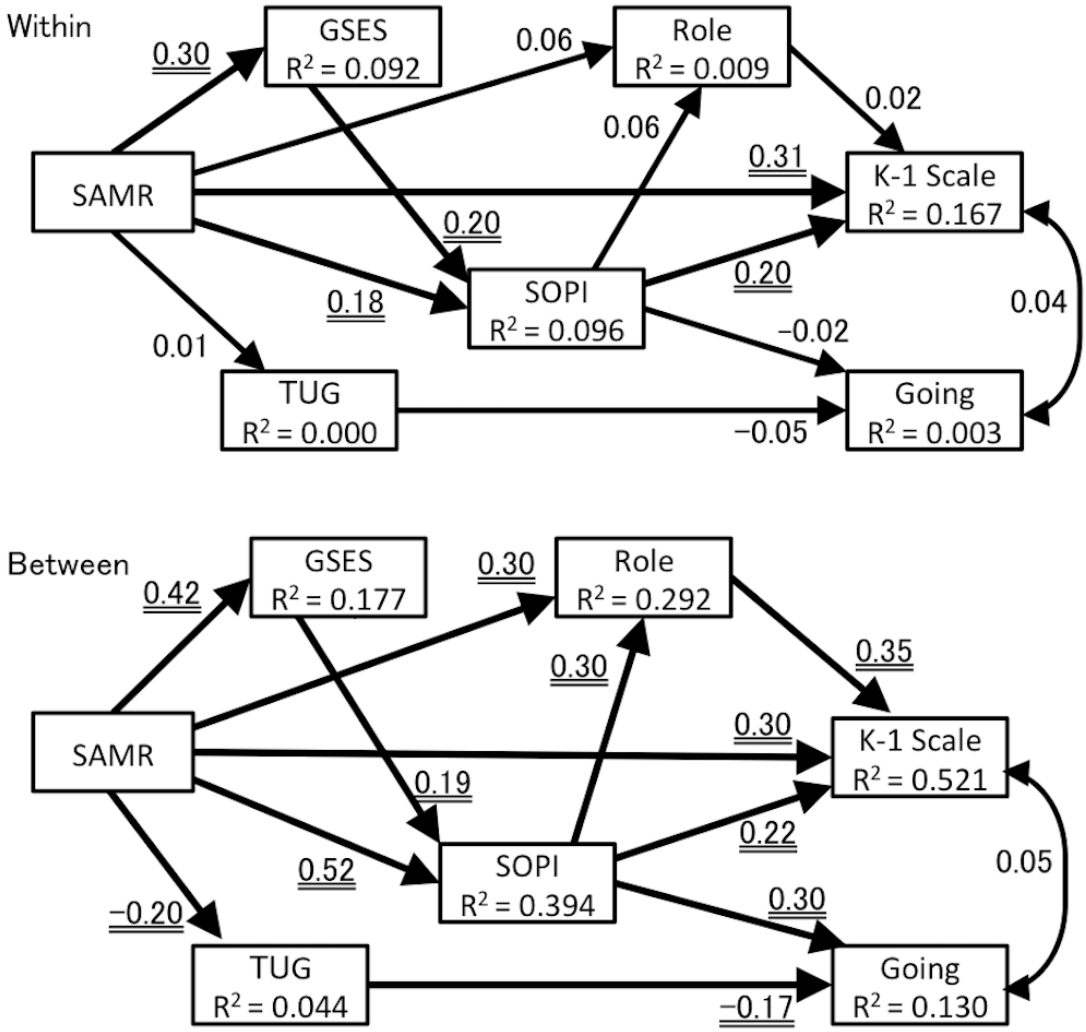
555 **Figure 2. Hypothesized model without hobby using MLSEM approach**

556 **Note.**

557 CFI = 0.742, TLI = 0.420, RMSEA = 0.073, AIC = 31933.48, BIC = 32220.59, adjusted BIC

558 = 32017.39.

559 The values written around the arrows are indicated standardized path coefficients estimated
560 by MLSEM approach. R^2 is indicated the adjusted R-square and is used as the coefficient of
561 determination. The error terms are omitted to make the figure simple. The paths coefficients
562 on underline are statistically significant at the 10% level; the paths on double line are
563 statistically significant at the 5% level.
564



565

566 **Figure 3. Modified model using MLSEM approach**

567 **Note.**

568 CFI = 0.904, TLI = 0.775, RMSEA = 0.064, AIC = 25201.17, BIC = 25389.59, adjusted BIC

569 = 25256.24.

570

571

572

573 **Table 1. Participant characteristics (at initial occasion)**

	Class	n=227	%
Gender	Men	109	48.0%
	Women	118	52.0%
Age: mean±SD (range)		77.1±8.6	(48-95)
Disease	Orthopedic	84	37.0%
	Neurological	84	37.0%
	Heart	3	1.3%
	Others	25	11.0%
	Unknown	31	13.7%
Care level	Care 5	0	0.0%
	Care 4	4	1.8%
	Care 3	17	7.5%
	Care 2	57	25.1%
	Care 1	58	25.6%
	Support 2	52	22.9%
	Support 1	37	16.3%
	Unknown	2	0.9%

574 **Note.**

575 It represents the number of answer and response frequencies (%) for each heading, it

576 represents mean, Standard Deviation (SD), and answer range in case of age.

577

578

Table 2. Descriptive statistics (at the three occasion)

	Initial occasion					Second occasion					Third occasion				
	Mean	SD	Skewnes	Kurtosis	Normality	Mean	SD	Skewnes	Kurtosis	Normality	Mean	SD	Skewnes	Kurtosis	Normality
SAMR	52.54	10.00	−0.60	0.93	0.00	51.22	9.33	−0.23	−0.05	0.20	51.25	9.96	−0.71	1.40	0.01
K-1 scale	21.43	7.28	−0.62	−0.48	0.00	21.43	7.43	−0.62	−0.39	0.00	21.59	7.32	−0.64	−0.25	0.00
SOPI	47.48	26.00	0.10	−0.64	0.00	47.27	26.31	−0.02	−0.85	0.02	48.66	25.44	−0.06	−0.66	0.08
GSES	8.56	4.17	−0.10	−0.97	0.00	8.11	4.16	−0.07	−0.77	0.02	8.30	4.38	−0.09	−1.01	0.00
Going out	4.10	3.22	3.44	21.46	0.00	3.65	2.68	2.02	8.18	0.00	3.88	3.00	1.71	4.60	0.00
Role	1.56	1.00	1.71	4.55	0.00	1.50	0.97	1.41	2.17	0.00	1.55	1.07	1.73	3.71	0.00
Hobby	1.47	1.29	2.37	13.59	0.00	1.67	2.18	9.86	127.17	0.00	1.76	3.46	12.13	168.14	0.00
Grip	22.30	7.96	0.74	0.64	0.00	22.56	7.84	0.69	0.10	0.00	22.57	8.01	0.67	0.24	0.00
Gait	12.17	7.95	3.38	14.68	0.00	11.96	7.73	3.29	14.13	0.00	13.51	8.98	3.65	19.60	0.00
TUG	13.27	7.72	2.63	9.42	0.00	13.44	8.69	3.04	12.38	0.00	11.93	7.70	3.83	20.01	0.00

Note.

SD, Standard Deviation; Discrimination, SAMR; Total score of scale for achievement motive in rehabilitation, K-1 scale; Total score of K-1 scale for the feeling that life is worth living among the aged, SOPI; Summary score of self-completed occupational index, GSES; Total score of general self-efficacy scale, Grip; Grip strength, Gait; Gait speed, TUG; Timed up & go.

Table 3. Multilevel Correlation analysis

	Roles	Going	K-1	SAMR	SOPI	GSES	Grip	TUG	Gait
Roles	-	.135 **	.057	.084 +	.093 +	.120 *	-.038	-.042	-.062
Going	**.386** **	-	.051	.041	-.007	.044	.002	-.038	.045
K-1	**.615** **	**.275** **	-	**.371** **	**.249** **	**.329** **	-.017	-.015	.054
SAMR	**.467** **	**.215** *	**.618** **	-	**.229** **	**.295** **	-.018	.011	.013
SOPI	**.453** **	**.318** **	**.590** **	**.590** **	-	**.263** **	.004	-.049	.039
GSES	**.206** *	.111	**.362** **	**.424** **	**.413** **	-	.042	-.033	-.044
Grip	.154 +	.138 +	.095	.159 *	.053	**.223** **	-	**-.393** **	-.108 *
TUG	**-.257** **	**-.220** **	-.160 *	-.187 *	-.191 *	.080	.014	-	**.327** **
Gait	**-.231** *	-.193 *	-.158 *	-.176 *	-.193 *	.075	-.001	**.881** **	-

Note.

Values for the within level are above the diagonal; values for the between level are below the diagonal.

$p^{+} < .10$, $p^{*} < .05$, $p^{**} < .01$.

Other abbreviations are similar to Table 2.

Table 4. The reliability of participants at the between/within levels

	P value (Within)	P value (Between)	ICC1	ICC2	DEFF
Roles	0.000	0.000	0.346	0.613	1.692
Going	0.000	0.000	0.508	0.756	2.016
Hobby	0.197	0.169	0.437	0.700	1.874
K-1	0.000	0.000	0.763	0.906	2.526
SAMR	0.000	0.000	0.621	0.831	2.242
SOPI	0.000	0.000	0.604	0.821	2.208
GSES	0.000	0.000	0.729	0.890	2.458
Grip	0.000	0.000	0.934	0.977	2.868
TUG	0.000	0.001	0.943	0.980	2.886
Gait	0.000	0.000	0.954	0.984	2.908

Notes.

P value (Within); the P values of within-class variance, P value (Between); the P values of between-class variance, ICC1; the intra-class correlations coefficient type 1, ICC2; the intra-class correlations coefficient type 2 (ICC2), DEFF; design effect.

The other abbreviations are similar to Table 2.

Table 5. Standardized estimates, standard errors, P value, and 95% IC for the MLSEM approach

Path	Within level					Between level				
				95% IC					95% IC	
	Estimate	SE	P value	Lower	Upper	Estimate	SE	P value	Lower	Upper
Direct effects										
SAMR	**On**									
K-1 Scale	0.312	0.058	0.000	0.197	0.426	0.300	0.093	0.001	0.118	0.483
SOPI	0.183	0.050	0.001	0.085	0.282	0.524	0.074	0.000	0.378	0.669
GSES	0.303	0.054	0.000	0.197	0.408	0.421	0.065	0.000	0.293	0.549
Role	0.061	0.042	0.145	-0.021	0.144	0.299	0.097	0.002	0.108	0.489
TUG	0.011	0.058	0.854	-0.103	0.124	-0.210	0.059	0.000	-0.326	-0.095
SOPI	**On**									
K-1 Scale	0.195	0.059	0.001	0.079	0.311	0.223	0.100	0.025	0.028	0.419
Role	0.062	0.046	0.176	-0.028	0.152	0.304	0.102	0.003	0.105	0.504
Going	-0.015	0.052	0.767	-0.117	0.087	0.297	0.089	0.001	0.122	0.472
GSES	**On**									
SOPI	0.201	0.049	0.000	0.105	0.297	0.190	0.072	0.008	0.049	0.332
Role	**On**									
K-1 Scale	0.022	0.045	0.622	-0.066	0.111	0.350	0.073	0.000	0.208	0.492
TUG	**On**									
Going	-0.048	0.037	0.191	-0.120	0.024	-0.170	0.055	0.002	-0.278	-0.062
K-1 Scale	**With**									
Going	0.035	0.041	0.390	-0.045	0.115	0.048	0.077	0.528	-0.102	0.198
Indirect effects										
SAMR	**On**									
K-1 Scale via SOPI										
	0.036	0.014	0.010	0.009	0.063	0.117	0.057	0.038	0.006	0.228
K-1 Scale via Role										
	0.001	0.003	0.644	-0.004	0.007	0.105	0.040	0.009	0.026	0.183
Sum	0.037	0.014	0.009	0.009	0.065	0.222	0.063	0.000	0.098	0.346
SAMR	**On**									

Going via SOPI										
	-0.003	0.009	0.765	-0.021	0.016	0.156	0.050	0.002	0.058	0.254
Going via TUG										
	-0.001	0.003	0.850	-0.006	0.005	0.036	0.016	0.024	0.005	0.067
Sum	-0.003	0.010	0.735	-0.023	0.016	0.191	0.050	0.000	0.093	0.290
SAMR	**On**									
SOPI via GSES										
	0.061	0.019	0.002	0.023	0.098	0.080	0.033	0.016	0.015	0.145

Note.

SE; Standard Error, other abbreviations are similar to Table 2.

“On” defines regression relationships; “With” defines correlation relationships.