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RESEARCH PAPER

Measuring functional ability in Healthy Ageing: testing its validity using Japanese nationwide longitudinal data

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Abstract

Background: The United Nations Decade of Healthy Ageing 2021–2030 suggests nations should monitor functional ability as an indicator of healthy ageing progress. Functional ability is the attribute of people to do something they value and consists of five domains. We examined its validity in terms of a construct, cross-validation across multiple waves' data, and predictivity for subsequent well-being.
Methods: Using panel data from 35,093 community-dwelling adults aged ≥65 years from the Japan Gerontological Evaluation Study, we performed factor analyses to explore the construct of functional ability domains in both 2013 and 2016. A modified Poisson regression analysis was employed to test their associations with well-being (subjective health and happiness) in 2019.
Results: The mean age (standard deviation) of participants was 72.1 (5.0) years, and 52.0% were women. A total of 85.0% reported good subjective health, and 50.6% reported high happiness levels. Factor analyses with 31 logically checked candidate items from 2016 data suggested a three-factor model comprising 24 items, which were compatible with the 2013 data results. Based on the World Health Organization's original domains, we named domains as domain #1: ability to build and maintain relationships; domain #2: ability to meet basic needs + ability to move around and domain #3: ability to learn, grow and make decisions + ability to contribute. All three domains predicted both subjective health and happiness in 2019.
Conclusions: Empirical data from Japan supports the functional ability concept among older individuals. Validating this concept with data from other nations is warranted.

Keywords: healthy ageing, functional ability, validation, World Health Organization, older people

Key Points

- Functional ability may have a three-factor structure that encompasses all five domains suggested by the World Health Organization (WHO).
- The domain includes ability to: build and maintain relationships; meet basic needs + move around and learn, grow and make decisions + contribute.
- All three domains of functional ability predicted subsequent well-being in community-dwelling older adults in Japan.
- The empirical evidence from this study supports the concept of functional ability as proposed by the WHO.
- Countries should consider monitoring functional ability as an indicator of healthy ageing progress.

Introduction

Ageing encompasses complex biological and social changes [1, 2]. Biologically, ageing is characterised by the gradual accumulation of diverse molecular and cellular damages, resulting in a decline in physical functions [2–4]. Societally, ageing brings about shifts in social responsibilities and identities, while also making individuals susceptible to ageism [5]. Ultimately, older people need to find a way to compensate for the decline in certain abilities and maintain their states [2]. Nevertheless, the ageing process could be valuable if they succeed in identifying effective strategies to navigate these adjustments.

The World Health Organization (WHO) proposed healthy ageing as a key concept that aims at creating environments and opportunities for maintaining functional states, to ultimately achieve universal well-being [2, 6]. Healthy ageing refers to 'the process of developing and maintaining the functional ability that enables well-being in older age' [2]. Functional ability is defined as 'the health-related attributes that enable people to be and to do what they have reason to value' [2]. Although people's values vary and change over time, well-being may rely on several common essentials, such as identity, relationships, enjoyment, autonomy, security, and personal growth [2, 7–9]. As crucial abilities that enable individuals to achieve well-being, the WHO proposed five domains of functional ability, including the ability to meet basic needs; learn, grow and make decisions; move around; build and maintain relationships and contribute [2]. According to the WHO, the functional ability is comprised of an individual's intrinsic capacity (i.e. 'the composite of all the physical and mental capacities of an individual') [2] and environmental factors (i.e. 'all the factors in the extrinsic world that form the context of an individual's life') [2], along with the interaction of these two factors [2]. Intrinsic capacity determines what a person can do, while environmental factors facilitate or impede action and ultimately determine what the person can achieve with their functional ability. For instance, if hearing loss is defined as a reduction in the intrinsic capacity of auditory perception, combining it with environmental factors, such as hearing aids or sign language translators, can widen an individual's choices and enable them to participate in social activities with increased functional ability, and ultimately enhance their well-being as an ultimate goal of healthy ageing.

The United Nations Decade of Healthy Ageing 2021–2030 suggests that each country monitor functional ability, intrinsic capacity and environmental factors as indicators of healthy ageing progress [10]. While intrinsic capacity has been examined and quantified in several studies [11], research on the validity of the functional ability concept remains limited. Moreno-Agostino et al. [12] investigated overall healthy ageing, including relationships among environmental factors, functional ability without domain specification and well-being using cross-sectional data. In addition, the WHO provided baseline data on functional ability, focusing on meeting basic needs only, such as dressing, taking medications and managing money, across 42 different countries [10, 13].

However, we found no study that empirically examined the validity of the WHO's functional ability concept within their framework for healthy ageing. Specifically, to the best of our knowledge, no studies have investigated the functional ability concept's validity in terms of its appropriateness for division into five domains (construct validity), cross-validation across different data (cross-validity) and predictivity for subsequent well-being (predictive validity), using quantitative data. The lack of validation of the functional ability concept poses several challenges for accurately and consistently measuring functional ability across diverse populations and contexts, as well as for determining its appropriateness as an indicator of healthy ageing. The concept of functional ability encompasses a range of abilities individuals need to engage in activities they find valuable and meaningful [2, 10, 14]. The significance and valuations of these abilities may vary across cultures and contexts, thereby resulting in inconsistent measurement of functional ability, barrier to comparisons of healthy ageing progress across countries and ultimately making it difficult to identify areas requiring interventions.

Therefore, in this study, we aimed to examine the functional ability's construct validity, cross-validity and predictive validity using longitudinal data of older adults in Japan, a country at the forefront of population ageing [15]. This study is expected to encourage other countries to develop functional ability indicators, which in turn will facilitate each country to monitor the progress of healthy ageing, and develop effective interventions and policies for universal well-being.

Methods

Data

We used three-wave panel data from the Japan Gerontological Evaluation Study (JAGES), an ongoing nationwide survey of physically and cognitively independent community-dwelling older adults aged ≥65 years in Japan [16]. The JAGES, described in detail elsewhere [17], conducted a baseline survey in 2013 with 193,694 individuals from 31 municipalities (response rate = 71.1%). For the second survey in 2016, 279,661 participants from 39 municipalities were sampled (response rate = 70.2%). In 2019, the third survey sampled 364,649 people from 64 municipalities (response rate = 69.4%). Data from three municipalities in the third survey were excluded due to COVID-19 pandemic timing. Our analytic sample included 35,093 individuals from 21 municipalities, involved in all three surveys. The JAGES protocol was approved by the Ethical Committee of the National Center for Geriatrics and Gerontology (approval no. 992), Chiba University (approval no. 2493) and Kyoto University (R3153-2).

Measurement

Exposure: functional ability (the second survey in 2016)

Following the standard process of scale development [18], we first generated an item pool of 31 candidate variables that are likely to reflect the functional ability concept based on the functional ability checklist in the Decade of health ageing: baseline report [19] and the definition of each domain in the WHO's World Report on Ageing and Health [2] (Appendix 1). To evaluate content validity, we then engaged several experts in gerontology who reviewed our item pool using JAGES data during the monthly research conference organised by the JAGES office. They confirmed that all 31 selected items indeed captured the essence of the functional ability concept, and no further JAGES items could be added. The standardised factor scores of each domain were used as the functional ability domain scores [20].

Outcome: well-being (the third survey in 2019)

Our outcomes of interest in predictive validity assessments were subjective health and happiness as components of well-being. Subjective health is known to be correlated with meaning in life [21], eudaimonic well-being and subjective well-being [22]. Participants were asked, 'How is your current health status?' and responded as '*Excellent*', '*Good*', '*Fair*' or '*Poor*'. The variable was dichotomised into 'good' ('*Excellent*' or '*Good*') and 'not good' ('*Fair*' or '*Poor*'). Happiness is another aspect of well-being, a widely accepted concept of fundamental objective among humans [23, 24]. In the JAGES, participants were asked, 'To what degree do you feel you are currently happy?' and scored '*0*' for very unhappy and '*10*' for very happy. We set the threshold using a median value (8 points) to dichotomise the variable into 'high happiness level' and 'low happiness level', as the variable was not normally distributed.

Covariates (baseline survey in 2013)

We controlled for potential confounders in 2013, including gender, age, education (≤9, 10–12, ≥13 years or other), comorbidities (one or more versus none), equivalised income (Japanese yen: annual household income reported in categories was equivalised for household size and coded in binary using median), marital status (married, widowed, separated, unmarried, or other), living status (whether living alone or with other(s)) and baseline outcome and exposure [25]. Well-being and functional abilities were selected to match the outcomes and domains, respectively.

Statistical analysis

After we imputed missing values in the above-mentioned variables using the random forest approach with the *missRanger* package in R (Appendix 2) [26–29], we performed explanatory and confirmatory factor analyses to examine construct validity using the *lavaan* package in R [30]. Factor analysis was selected to explore the underlying structure and interrelationships among the potentially interconnected variables within the JAGES dataset. Explanatory factor analysis was conducted using the promax rotation and maximum likelihood method [31]. Details on factor analysis are described in Appendix 3. Subsequently, we conducted a confirmatory factor analysis. The model fit was tested using the Comparative Fit Index (CFI), Turker–Lewis Index (TLI), Root Mean Squared Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) [31]. We also examined the cross-validity by performing a series of factor analyses using data from the baseline survey in 2013.

To examine the relationship between functional ability domains in 2016 and subjective health and happiness in 2019, we estimated the relative risks (RR) for these outcomes using modified Poisson regression analyses adjusting for all covariates listed above [32]. Additionally, we examined potential dose–response associations by using quintile functional ability scores within the modified Poisson regression models mentioned earlier. Finally, we conducted a stratified analysis by gender.

We subsequently conducted sensitivity analyses using modified Poisson regression. These analyses encompassed the following variations: (i) a different threshold of happiness using 10 points instead of the median to have the same distribution as subjective health; (ii) complete case; (iii) inverse probability of censoring weighting approach to adjust the bias due to loss to follow-up and (iv) different indicators of functional ability.

All analyses were performed using Stata version 15.1 (Stata Corporation, College Station, Texas, USA) and R version 3.6.2.

Results

The mean age (standard deviation) of 35,093 participants was 72.1 (5.0), and 52.0% were women (Table 1). The loss-to-follow-up demonstrated a similar trend (Appendix 4). Those who reported good subjective health and high happiness levels were 85.0% (n = 29,836) and 50.6% (n = 17,753), respectively. Those individuals with good subjective health were more likely to be female (52.7%), in the ≥70, <85 aged groups (62.1%), with 10–12 years of education (41.9%), with one or more comorbidities (78.6%), with low equivalised income (50.1%), married (77.5%) and living with other(s) (87.6%). Notably, for those with high happiness levels, the trends of the associating factors were similar to those for good subjective health, except for equivalised income, showing a high happiness level among those with high equivalised income (54.7%).

Explanatory factor analysis suggested three factors, which comprised 24 variables and demonstrated a Cronbach's alpha coefficient of 0.79 (Table 2). Although the Cronbach's alpha coefficient for the five-factor model was also 0.79 (Appendix 5), fewer variables were included in one factor and the interpretability of the item sets included in each factor was lower compared with that of the three-factor model. In the three-factor model, each factor was given

Table 1. Characteristics of final analysis sample[a]

	Overall		Good subjective health (versus not good)		High happiness level (versus low)	
	(*n* = 35,093)		(*n* = 29,836 (85.0%))		(*n* = 17,753 (50.6%))	
	n	%	*n*	%	*n*	%
Gender						
Male	16,846	(48.0)	14,122	(47.3)	7,746	(43.6)
Female	18,247	(52.0)	15,714	(52.7)	10,007	(56.4)
Age category						
≥65, <70	12,321	(35.1)	10,901	(36.5)	6,069	(34.2)
≥70, <85	22,238	(63.4)	18,519	(62.1)	11,365	(64.0)
≥85	534	(1.5)	416	(1.4)	319	(1.8)
Education						
9 years and under	11,400	(32.5)	9,303	(31.2)	5,576	(31.4)
10–12 years	14,556	(41.5)	12,504	(41.9)	7,235	(40.8)
13 years and over	8,973	(25.6)	7,892	(26.5)	4,859	(27.4)
Other	164	(0.5)	137	(0.5)	83	(0.5)
Comorbidities						
One or more	28,241	(80.5)	23,437	(78.6)	13,893	(78.3)
None	6,852	(19.5)	6,399	(21.5)	3,860	(21.7)
Equivalised income						
High	16,990	(48.4)	14,895	(49.9)	9,705	(54.7)
Low	18,103	(51.6)	14,941	(50.1)	8,048	(45.3)
Marital status						
Married	27,130	(77.3)	23,107	(77.5)	13,927	(78.5)
Widowed	5,771	(16.4)	4,906	(16.4)	3,060	(17.2)
Separated	1,208	(3.4)	1,006	(3.4)	444	(2.5)
Unmarried	798	(2.3)	679	(2.3)	249	(1.4)
Other	186	(0.5)	138	(0.5)	73	(0.4)
Living status						
Living alone	4,383	(12.5)	3,715	(12.5)	1,874	(10.6)
Living with other(s)	30,710	(87.5)	26,121	(87.6)	15,879	(89.4)

[a]Missing values have been imputed using random forest approach.

operational name as 'domain #1: Ability to build and maintain relationships', 'domain #2: Ability to meet basic needs + ability to move around' and 'domain #3: Ability to learn, grow, and make decisions + ability to contribute', respectively. This was performed based on the WHO's original domain names and the characteristics of each domain's items, such as friendships and social relationships, daily behaviour and activities and participation in social events. Moreover, the confirmatory analysis showed that the three-factor model provided a good fit for the data (CFI = 0.80, TLI = 0.77, RMSEA = 0.06, and SRMR = 0.06) (Table 2). The analysis also indicated that the covariances between factors 1 and 3 were higher than those of the other combinations (0.31 versus 0.21 and 0.17) (Table 2). Another series of factor analyses using baseline data in 2013 showed compatible results (Appendix 6).

The functional ability scores across various sociodemographic characteristics showed that women, individuals aged <85, those with longer educational histories, those living alone, individuals with higher equivalised income and those without comorbidities consistently exhibited higher functional ability scores in all three domains (Figure 1). However, domain #2 demonstrated a divergent trend compared to domains #1 and #3, specifically among the oldest age group and those who were widowed, separated or unmarried. The oldest age group exhibited a lower score of functional ability domain #2 (−1.05). Additionally, the domain #2 score was lower among the widowed individuals, while the separated and unmarried groups demonstrated elevated scores. In contrast, domains #1 and #3 had higher scores in widowed, and lower scores in both separated and unmarried groups.

In a modified Poisson regression analysis, one standard deviation increase in each of the three domains of functional ability was associated with a 1.03–1.05 times increase in the likelihood of good subjective health and high happiness levels 3 years later (good subjective health: domain #1, RR [95% confidence interval (CI)] = 1.03[1.02–1.04]; #2, RR [95% CI] = 1.05[1.04–1.06] and #3, RR [95% CI] = 1.03[1.03–1.04]. High happiness level: domain #1, RR [95% CI] = 1.05[1.04–1.07]; #2, RR [95% CI] = 1.03[1.02–1.05] and #3, RR [95% CI] = 1.05[1.04–1.07]) (Figure 2, Appendix 7). We also found a dose–response relationship between functional ability domains, good subjective health and high happiness levels (Appendix 8). We observed no evident differences based on gender (Appendix 9).

We obtained consistent results when we (i) used an alternative happiness threshold (i.e. 10 instead of 8), (ii) conducted a complete-case analysis, (iii) applied the inverse probability of censoring weighting approach to account for bias due to loss to follow-up and (iv) used different indicators of functional ability (Appendix 10).

Table 2. Summary of factor analyses results

Candidate indicators of functional ability	Explanatory factor analysis[a]				Confirmatory factor analysis		
	Factor loading			Commonality	Factor loading		
	Factor 1 (Domain #1: Ability to build and maintain relationships)	Factor 2 (Domain #2: Ability to meet basic needs + ability to move around)	Factor 3 (Domain #3: Ability to learn, grow and make decisions + ability to contribute)		Factor 1 (Domain #1: Ability to build and maintain relationships)	Factor 2 (Domain #2: Ability to meet basic needs + ability to move around)	Factor 3 (Domain #3: Ability to learn, grow and make decisions + ability to contribute)
Having friends to visit	0.31	0.04	0.17	0.19	0.40	..	..
Having another individual to meet with	0.90	−0.12	−0.22	0.59	0.76	..	..
Meeting frequently with another individual	0.51	−0.06	0.16	0.34	0.56	..	..
The number of contacts you had with another individual	1.05	−0.19	−0.22	0.78	0.85	..	..
Advising another individual	0.23	0.11	0.09	0.13	0.32	..	..
Listening to other individuals' concerns or complaints	0.20	0.04	0.03	0.06	0.23	..	..
Needs for nursing care or assistance	−0.01	0.25	−0.01	0.06	..	0.25	..
Cooking by yourself	0.02	0.30	−0.01	0.10	..	0.31	..
Paying bills by yourself	−0.08	0.68	−0.07	0.40	..	0.63	..
Managing money by yourself	−0.06	0.64	−0.05	0.36	..	0.60	..
Completing paperwork by yourself	−0.04	0.48	0.00	0.21	..	0.46	..
Shopping for daily necessities	−0.06	0.58	−0.05	0.30	..	0.55	..
Reading books or magazines	0.04	0.19	0.09	0.07	..	0.22	..
Visiting another individual falling ill	0.14	0.26	0.00	0.12	..	0.31	..
Going out alone by train or bus	−0.06	0.50	−0.01	0.23	..	0.48	..
Attending learning or cultural groups	−0.07	0.00	0.59	0.30	..	..	0.55
Attending health-related activities	−0.09	−0.03	0.61	0.32	..	..	0.56
Attending sports group or club	0.03	0.01	0.53	0.31	..	..	0.56
Attending hobby group	0.06	0.01	0.58	0.38	..	..	0.61
Attending senior citizen club	−0.02	−0.07	0.49	0.22	..	..	0.47
Having a managerial role	0.01	−0.01	0.51	0.26	..	..	0.52
Attending volunteer group	−0.06	−0.03	0.67	0.39	..	..	0.63
Attending activities to teach skills or pass on experiences to others	−0.05	−0.02	0.51	0.23	..	..	0.48
Attending neighbourhood associations or residents' associations	0.01	−0.01	0.44	0.19	..	..	0.44
	Cronbach's alpha coefficient		0.79		**Model fit indicators:**		
						CFI	0.80
						TLI	0.77
						RMSEA	0.06
						SRMR	0.06
	Range of functional ability domain scores:				**Covariances:**		
		Domain #1	−6.27 to 0.87			**Factors 1 and 2**	0.21
		Domain #2	−13.02 to 0.51			**Factors 1 and 3**	0.31
		Domain #3	−1.76 to 2.60			**Factors 2 and 3**	0.17

[a]Promax rotation with the maximum likelihood method was used for explanatory factor analysis.

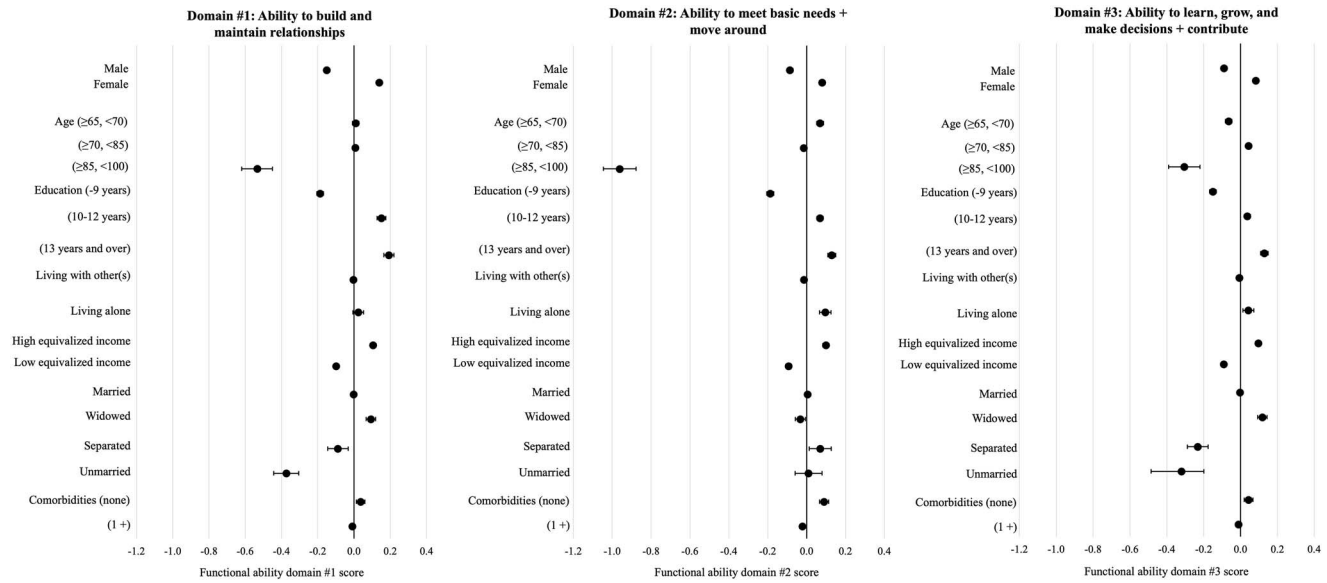

Figure 1. Functional ability domain scores by sociodemographic characteristics.

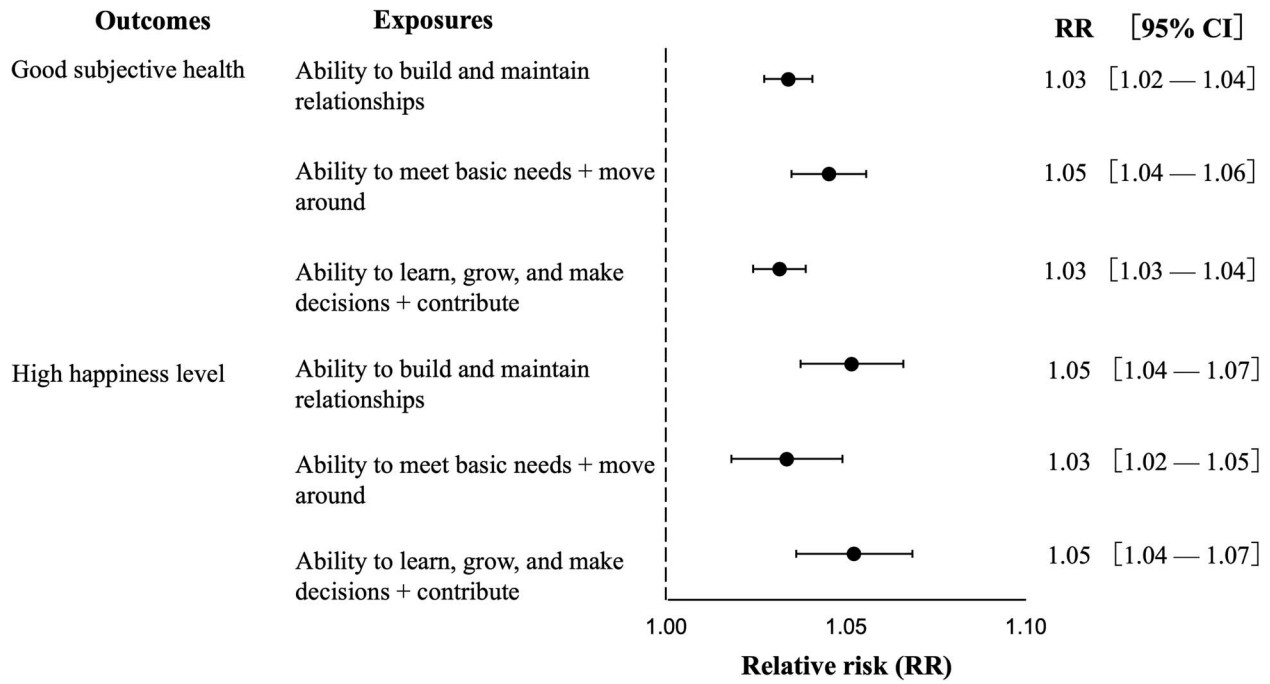

Figure 2. Relative risks (RR) for good subjective health and high happiness level: results of modified Poisson regression analyses. Each modified Poisson regression model was adjusted for potential confounders in 2013, namely, gender, age, education, equivalized income, comorbidities, marital status, living status, functional ability score, and well-being. The high happiness level was defined as 8 points.

Discussion

This longitudinal study among community-dwelling older adults in Japan suggests that functional ability has a three-factor structure that may cover all five domains proposed by the WHO, cross-validity across different wave's data and predictivity for subsequent well-being. We identified the three domains of functional ability using 2013 and 2016 data, respectively. Each of the three factors was named as 'domain #1: Ability to build and maintain relationships', 'domain #2: Ability to meet basic needs + ability to move around' and 'domain #3: Ability to learn, grow and make decisions + ability to contribute'. Overall, functional ability scores across sociodemographic characteristics were compatible across all three domains, except for differences in the highest age category and marital status. In addition, all three domains of functional ability were associated with good subjective health and high happiness levels 3 years later.

To the best of our knowledge, this is the first study to examine the validity of the concept of functional ability using longitudinal data. Moreno-Agostino et al. [12] assessed overall functional ability in 2,825 Philippine older adults, associated it with subjective well-being. However, their cross-sectional design limited predictive and causal insights. In contrast, our longitudinal study comprehensively examined the series of validities of functional ability, advancing empirical understanding of the concept.

Our functional ability measure did not differentiate between 'ability to meet basic needs' and 'ability to move around', nor between 'ability to learn, grow and make decisions' and 'ability to contribute'. This may be due to their complementary nature. 'Ability to meet basic needs' and 'ability to move around' pertain to essential physical aspects of daily activities that are necessary for fulfilling basic needs, while 'ability to learn, grow and make decisions' and 'ability to contribute' encompass overlapping social aspects. Particularly, contributing to others or society involves personal growth, entailing decision-making and learning for implementation. The JAGES, focused on physically independent older adults and not originally aligned with WHO's healthy ageing concept, might also explain this partial lack of differentiation. For a comprehensive understanding, data should span various ageing trajectories, from full independence to bedridden states, with specific attention to each functional ability domain for a clearer distinction of all five domains.

The functional ability domain scores in Figure 1 may reflect differences in sociodemographic characteristics of healthy ageing. Lower scores in a specific domain may indicate that the group is having difficulty in being and doing what they value in order to achieve well-being through the use of that domain. In all three domains, women have higher scores than men, suggesting that women are more likely than men to be able to engage in activities that they perceive as valuable and that may lead to healthy ageing. The domain #2 score was lower in the oldest age group. This could be due to an age-related decline in physical function, which may directly affect the 'ability to move around', a component of domain #2. This suggests that the development and maintenance of domain #2 may become more challenging with age. In addition, the lower domain #2 score among widowed may also be explained by age since older individuals are more likely to experience such loss. Accumulated studies have suggested that widows tend to have poorer health than married individuals do [33, 34]. Conversely, widows showed higher scores for domains #1 and #3, which could be due to their ability to connect with others, as indicated by their marital history. Those who were separated due to certain circumstances or have chosen to remain unmarried may tend to be socially isolated or experience loneliness [35, 36], which could lead to lower scores in domains #1 and #3 compared to those in others. Therefore, separated and unmarried older adults may need social and community involvement, as they are more likely to experience social isolation and loneliness through a decline in domains #1 and #3.

All three domains of functional ability predicted an increase of 1.03–1.05 times in the likelihood of subsequent well-being. While the estimates were relatively small, considering the extensive scale of the target population, with approximately 30 million individuals aged 65 and above without care needs in Japan [37], the impact of the values should not be underestimated. One of the plausible reasons underlying the association between functional ability and subsequent well-being is the increased freedom of choice that is based on Sen's capability approach. The capability approach is another concept related to healthy ageing that emphasizes the importance of functional ability and is a way of defining a set of potential combinations of available functions to individuals, representing the possible ways they could live [38, 39]. He suggests that even if an individual's preferred choice is already available, additional options can improve well-being [40, 41]. This idea is consistent with WHO's broader concept of healthy ageing, which suggests that individuals can achieve well-being by having diverse environmental options for valued activities. Further study is needed to identify which environmental factors enhance functional abilities and lead to well-being.

Our study has some limitations. First, our findings may not be extended to older people in other countries, given the possible difference in the pattern of functional ability and well-being across countries. However, as far as we know, there appears to be no logical explanation or evidence to effectively account for the obtained results of this study based solely on Japanese attributes. Second, our results may be susceptible to measurement error because of the nature of the self-administered survey. Individuals with higher functional ability scores may be more likely to report as subjectively healthy or having higher levels of happiness, which could overestimate the effect of functional ability on well-being. However, measuring subjective health and happiness with self-administered data can be appropriate, considering the subjective nature of well-being. Third, although we included a set of covariates, our findings might suffer from uncontrolled confounding. For example, the severity of comorbidities could lower functional ability scores and affect well-being. Fourth, potential selection bias due to dropout during follow-up may have caused an overestimation of the results because it is suspected that older people who participated in all three surveys are more likely to have higher levels of functional abilities and resilient well-being. Lastly, although happiness and subjective health are considered major components of well-being [21–24], our study did not capture the complexity of well-being due to its attributes as a multidimensional construct.

The monitoring of healthy ageing progress, as outlined by the United Nations Decade of Healthy Ageing 2021–2030 [10], may be achievable by aggregating individual functional ability scores within countries and calculating standardised scores for the population and subgroups. By identifying relevant metrics or collecting new data, countries could enable international comparisons of healthy ageing based on

functional ability domains. To achieve this, standardisation of data collection methods, questionnaire content, formats and validation approaches is crucial. Promoting validation studies on functional ability with quantitative data in each country could improve cross-national validity. This contributes to international monitoring of progress in healthy ageing and the integration of healthy ageing concepts into global health policy. Moreover, although further research is warranted, functional ability scores could benefit clinicians and geriatricians by aiding in the evaluation of older patients' abilities and the formulation of interventions to promote well-being.

In conclusion, our findings suggest that the concept of functional ability is supported by the empirical data of older people in Japan in terms of its construct, cross-validation and predictivity for subsequent well-being. This study provided the first insight towards a better understanding of functional ability and its role in healthy ageing.

Supplementary Data: Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

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Data Availability: The JAGES dataset, supporting the findings of this article, was collected as part of the JAGES, with approval from the ethical review committees at the National Center for Geriatrics and Gerontology, Chiba University and Kyoto University. The JAGES dataset is available in response to the request from the researchers admitted by the JAGES committee (dataadmin.ml@jages.net). The authors of this article conducted the analysis using non-identifiable and anonymised data provided by the JAGES committee. Linkage with individual identifying information is only possible at the JAGES participated municipalities. All JAGES datasets are subject to ethical or legal restrictions on public disclosure due to the presence of sensitive information from human participants. All analyses reported in this article were conducted in Stata 15.1 and R version 3.6.2. On request, the first author will provide all of the source code that was used to generate the results shown in this article.

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