

# Validation of the Korean Version of the Awareness of Age-Related Change (AARC) Questionnaire in a Sample of Middle-aged and Older Adults<sup>†</sup>

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Subjective aging, which refers to the attitudes and awareness of aging, has a significant impact on health, well-being, and mortality in later life. Among several tools that measure subjective aging, the Awareness of Age-Related Change (AARC) Questionnaire, which is the most recently developed, measures how an individual's awareness of aging in various areas of behavior results in their awareness of age-related gains and losses. This study aimed to validate the Korean version of the AARC (K-AARC) in the Korean population aged 40 and above. A total of 411 adults (aged 40-87 years) completed a survey on AARC, felt age, attitudes toward own aging, self-perceptions of aging, subjective well-being and Age Stereotypes scale. Exploratory factor analysis identified a two-factor structure (AARC gains and AARC losses), which was closely resembled the original model shown by Brothers et al. (2019). Confirmatory factor analysis revealed that the two-factor structure of the AARC was similar to the original AARC, except for the Physical Health domain from the AARC gains, which was positively correlated with the AARC losses. Adequate convergent validity was demonstrated by significant correlations between the AARC and felt age, attitudes toward own aging, self-perceptions of aging and subjective well-being. The relationship between the AARC and Age Stereotypes scales was also significant but small, providing evidence for divergent validity. The results support the reliability and validity of the Korean version of the AARC as a useful tool to capture adults' positive and negative subjective aging experiences.

*Keywords: awareness of age-related change(AARC), subjective aging, older adults, well-being, validation*

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Despite being a natural part of human development, attitudes and perceptions that adults hold about aging are generally negative (Kite et al., 2005). However, according to Baltes and Baltes (1993), aging is a process of both loss and gain, and successful aging is the result of a life-course strategy that minimizes loss and maximizes gain (Baltes, 1993; Baltes & Baltes, 1990). Thus, aging involves both negative and positive changes.

The way in which people perceive aging, or subjective aging, is defined as “all those experiences that make a person aware that his or her behavior, level of performance, or ways of experiencing his or her life have changed as a consequence of having grown older” (Diehl & Wahl, 2010, p.340). Subjective aging has not only been found to be useful in predicting physical function decline and mortality (Sargent-Cox et al., 2014), but also in predicting lifespan, with people who have a positive perception of aging living approximately 7.5 years longer than those who do not (Westerhof et al., 2014). The effects of subjective aging on health behaviors, cognitive function, interpersonal relationships, and other aspects vary depending on whether an individual has a positive or negative perception of aging. Specifically, previous research has demonstrated that negative subjective aging is associated with a decrease in activities of daily living (ADL) (Moser et al., 2011), and can

impede engagement in healthy physical and mental behaviors, such as having a will to live and a healthy cardiovascular response to stress, due to perceiving age-related changes as losses (Hummert, 2011). On the contrary, positive subjective aging is associated with high levels of well-being, as shown by the positive relationship between satisfaction with life (Brothers et al., 2017) and self-rated health (Beyer et al., 2015).

There are several ways to measure individual experiences of subjective aging. Single-item measures, such as asking about felt age (e.g., “Fill in the age (in years) that you feel most of the time: \_\_,” Kastenbaum et al., 1972) and the Attitudes Toward Own Aging (ATOA) subscale of the Philadelphia Geriatric Morale Scale (Lawton, 1975), are commonly used. Felt age has been demonstrated to be a robust predictor of physical and psychological well-being (Barrett, 2003; Hubley & Russell, 2009). However, it is limited in that it only reflects an individual’s perception of aging as a perceived age. The five-item ATOA scale is simple yet effective in measuring how positive an individual’s attitude towards aging is and is widely used in various studies (Kavirajan et al., 2011; Kotter-Grunn & Hess, 2012). The ATOA scale distinguishes between the affective and cognitive domains in measuring attitudes towards aging, making it more specific than a single-item measure of subjective aging. The ATOA assesses attitudes

towards aging using a bipolar positive–negative rating format. Another scale, the views on aging scale (Kornadt & Rothermund, 2011), allows multidimensional evaluation by measuring age stereotypes in eight different domains of life (such as personality and employment) that are affected by aging. However, it is known to measure the general thinking about aging in other people, not one’s own aging. It is worth noting that this scale assesses general perceptions of older adults rather than one’s own experience of aging, making it different from subjective aging in that it is not self-reflective (Diehl & Wahl, 2010).

Recently, Brothers et al. (2019) introduced the Awareness of Age-Related Change (AARC) questionnaire, designed to address the shortcomings of previous subjective aging measures. The AARC questionnaire was developed based on a qualitative interview of midlife adults in the United States and Germany, which resulted in 189 items (Miche et al., 2014). The validity of the questionnaire was confirmed with a sample of 810 individuals, resulting in the final 50-item AARC. The AARC assesses age-related changes in a multidimensional manner across five domains. Moreover, the AARC evaluates changes in these domains in a multidirectional manner, considering both positive (gains) and negative (losses) aspects. For instance, in the area of cognitive functioning, the scale considers both

the experiences of becoming forgetful (cognitive functioning–negative; “I am more forgetful”) and becoming wiser (cognitive functioning–positive; “I have become wiser”) as a result of aging. In total, the AARC encompasses ten subscales that reflect the experiences of both advantages and disadvantages within the five domains.

AARC has been increasingly used in research on the awareness of aging owing to its advantages. The AARC is highly correlated with other subjective aging scales. Perceiving oneself as older than one’s chronological age and having negative attitudes towards aging (as indicated by lower scores on the ATOA scale) were both significantly associated with greater awareness of negative age-related change (Brothers et al., 2016; 2018). Several studies have demonstrated a relationship between AARC and both physical and psychological well-being (Sabatini et al., 2020; Windsor et al., 2022). In a study by Brothers et al. (2017), AARC losses were found to be associated with lower levels of functional health and life satisfaction. Furthermore, AARC losses were found to mediate the relationship between subjective aging (felt age and ATOA) and well-being, suggesting that negative perceptions of subjective aging were more strongly related to awareness of negative age-related changes, which in turn predicted lower subjective well-being. A longitudinal study of by Dutt et al. (2016) that examined the relationship

between depression and AARC over 2.5 years, involving more than 350 adults aged 40 to 98 years old, also found a positive association between higher levels of AARC losses and depressive symptoms. Additionally, prior research has indicated that younger subjective age (Brothers et al., 2017), greater life satisfaction (Wahl et al., 2013), and experiencing positive emotions (Neupert & Bellingtier, 2017) are linked to AARC gains. Overall, it can be inferred that age-related changes are not only associated with subjective aging but also with psychological well-being, such as depression and positive or negative affect.

The AARC has been validated in various countries (Kaspar et al., 2019; Neri et al., 2021; Sabatini et al., 2020; Testad et al., 2022). Validation studies of the AARC conducted on adults aged 50 and over in the UK, Norway, and Portugal, found that the factor structure of the AARC consisted of two main factors (AARC gains and AARC losses), each of which includes five behavioral domains, consistent with Brothers et al. (2017).

Although the validity of the AARC has been established in various countries, its utilization in subjective aging research within East Asia remains limited. Given that Korea is aging faster than other OECD countries and is projected to become the world's most aged country within the next 20 years (KOSIS, 2020), utilizing the AARC to examine the aging

perception of Koreans could be valuable in enhancing the quality of life and aiding older individuals in adapting to aging. Recently, Nam and Kim (2021) conducted a study to validate the Korean version of the AARC and found two-factor structure similar to that reported by Brothers et al. (2019) consisting of losses and gains. However, unlike the findings of Brothers et al., the losses factor in the Korean version of the AARC was comprised of two subscales (awareness of losses in health and awareness of losses in non-health), while the gains factor had no subscales. Nam and Kim suggested that this discrepancy may be due to a negative attitude towards aging in East Asia, where senior derogation is prevalent, causing Korean older individuals to have a limited perception of the benefits of aging (North & Fiske, 2015). Additionally, the elevate poverty rate among older individuals aged 65 and above in Korea, which is the highest among OECD countries (Ministry of Health and Welfare, 2019), has generated the idea that economic insecurity may impact aging insecurity and result in individuals placing more emphasis on losses rather than benefits of aging. However, the study by Nam and Kim (2021) was limited to participants who were over 65 years old and resided in a single region, necessitating further investigation using a more diverse participant group to understand the characteristics of the AARC in Koreans. In the current study, we aimed to validate the

K-AARC by including participants of various age groups, from middle-aged adults over 40 to older adults over 80, in line with the study by Brothers et al. (2019). Assessing age-related changes in middle-aged adults who are preparing for their later life may aid in their future adaptation to the aging process. We conducted the study in various regions of Korea to ensure the sample accurately represented the demographic characteristics of middle-aged and older in Korea. To ensure that potential differences in age-related changes across different aspects of life and living environments were taken into account, we recruited participants from a variety of regions.

Furthermore, we examined the relationships

between the Korean version of the AARC and other questionnaires that evaluate subjective aging. We hypothesized that more AARC gains would be strongly associated with positive indicators of subjective aging, such as feeling younger than one's age, being more satisfied with one's aging process, noticing more positive experiences, and experiencing high levels of well-being. Conversely, we hypothesized that AARC losses would be strongly associated with negative indicators of subjective aging. Based on a study Meisner (2012), which suggested that individuals may view their own aging differently from how they view others' aging, we hypothesized that the relationship between the Age Stereotypes scale and the AARC scale

Table 1.  
*Demographic characteristics of participants*

	Calibration Sample	Cross Validation Sample	Total
<i>N</i>	215	196	411
Age(years), <i>M(SD)</i>	57.30(10.08) Range: 40 - 87	57.71(9.41) Range: 40 - 86	57.49(9.76) Range: 40 - 87
Gender (% women)	36.7%	44.4%	40.4%
Marital status			
Single	13.0%	9.2%	11.2%
Married	75.8%	82.1%	78.8%
Separated/divorced	8.4%	5.6%	7.1%
Widowed	2.8%	3.1%	11.2%
Education(years), <i>M(SD)</i>	14.83(2.49)	14.67(2.51)	14.76(2.50)
Degree			
Less than high school	3.2%	3%	3.1%
High school	22.3%	28.1%	25.1%
Associates	12.6%	11.7%	12.2%
Bachelors	49.8%	44.9%	47.7%
Graduate degree	12.1%	12.3%	12.2%
Self-rated health, <i>M(SD)</i>	3.26(0.78)	3.27(0.79)	3.26(0.78)

would be low or insignificant.

## Methods

### Participants and procedure

For this study, we recruited a total of 415 participants over the age of 40 either by visiting the laboratory in D city, or through an online survey company. Four participants with incomplete surveys were excluded from the final sample. Of the 411 participants (mean age: 57.49 years,  $SD$ : 9.77, age range: 40 - 87), 166 (40.4%) were women. The mean education years of the participants was 14.76 years ( $SD$ =2.50 years) and their self-rated health was 3.26 ( $SD$ =0.78, 1: *very poor* to 5: *very good*). Based on previous research utilizing structural equation modeling, a typical sample size of approximately 200 is recommended (Kline, 2011). In the current study, the total sample consisted of 411 participants, which was randomly split into two equal groups for the purpose of conducting exploratory and confirmatory factor analyses. Data from 215 and 196 participants were used as calibration and cross-validation samples for exploratory and confirmatory factor analysis, respectively<sup>1)</sup>. There were no statistically significant differences between the two samples in terms of age, years of education, and

self-rated health (all  $p$ s>.05) (Table 1). Prior to participation, all participants were provided with an explanation of the study and gave their voluntary consent to participate. They were informed that they could discontinue the survey at any time without any adverse consequences. The order of items in the Korean version of the AARC was randomized for each participant. Upon completion of the survey, participants were compensated with either a monetary reward or points equivalent to the reward (₩25,000). Reward points could be exchanged for gift certificates through the survey site. This study was approved by the Institutional Review Board (201911-SB-197-01).

### Measures

#### Awareness of age-related change(AARC)

This study used the AARC developed by Brothers et al. (2019) to measure awareness of age-related change. The AARC consists of 50 items divided into two factors: gains and losses. The gains factor reflects the awareness of changes associated with aging as positive, whereas the losses factor reflects the perception of such changes as negative. These two factors were further divided into five areas of daily life: health and physical functioning, cognitive

1) The median age of calibration sample was 59(male=60, female=56), and cross validation sample was 60(male=59, female=60).

functioning, social-cognitive and social-emotional functioning, interpersonal function, and lifestyle and engagement, yielding a total of 10 subscales (Table 2). The scale uses a 5-point Likert scale (1 = *not at all* to 5 = *very much*), the total score of each subscale ranges from 1 to 25, with a higher total score indicating a greater awareness of age-related change in each domain as gains or losses as one gets older. The final version of the AARC used in this study showed excellent internal consistency for both the gain and loss items (Cronbach's  $\alpha = .92$ ; Cronbach's  $\alpha = .93$ ).

The process of adapting the original scale into Korean involved several steps. First, an initial English-Korean translation was performed by two members of the research team and one individual who was responsible for editing with the publisher. This initial translation was

approved by the developer of the scale, who was also a co-author of the study, after receiving Korean language adaptation and validation approval. Next, the first draft of the translation was reviewed and verified by a clinical psychologist professor and an English-Korean bilingual psychology master's student to ensure that the meaning was accurately conveyed. The translation was then reviewed and revised through a process of translation-back-translation until the Korean version was deemed to be expressed naturally and the meaning was clearly conveyed. Finally, the back-translation version was submitted to the developer for validity verification and feedback, and after incorporating any necessary modifications, the final Korean version of the scale was completed.

Table 2

*Examples of items for each subscale of the K-AARC*

Factor	Subscales	N	"나는 나이가 들면서 ..."고 느낀다.
Gains(+)	PHYS	5	건강과 체력관리에 더 시간을 투자한다
	COG	5	더 지혜로워졌다
	INT	5	가족이 나에게 더 소중해졌다
	SC/SE	5	자신감이 높아졌다
	LIFE	5	삶을 더 즐기려고 노력한다
Losses(-)	PHYS	5	이전보다 기운이 없다
	COG	5	더 자주 깜빡하거나 잊어버린다
	INT	5	다른 사람들의 도움에 더 의지한다
	SC/SE	5	죽음에 대한 생각이 늘었다
	LIFE	5	경제적으로 불안정하다

*Note.* PHYS=Health and Physical Functioning; COG=Cognitive Functioning; SC/SE, Social-Cognitive and Social-Emotional Functioning; INT=Interpersonal Function; LIFE=Lifestyle and engagement

## Felt Age

To evaluate the subjective age, we used the method developed by Westerhof and Barrett (2005). Participants were asked, “How old do you usually feel?” and were asked to choose between “the same as my chronological age” or “older or younger than my chronological age.” Those who felt older or younger than their actual age were asked to report their subjective age (in years). Felt age was operationalized as the ratio of difference between chronological age and felt age divided by chronological age. A negative and positive ratio score indicated that the participant felt younger and older than their actual age. If the participant responded that they felt “the same as my actual age,” the ratio score was calculated as 0. The ratio scores ranged from  $-.68$  (feeling 68% younger) to  $.14$  (feeling 14% older).

## Attitudes Toward Own Aging(ATOA)

We used a five-item subscale from the Philadelphia Geriatric Center Morale Scale (PGCMS) developed by Lawton (1975), which measures attitudes towards one’s own aging. The ATOA scales validated and translated into Korean by Ryu et al. (2012) was used in this study. Participants responded to a set of 5 items using a binary response scale (i.e., Yes or No). A higher total score indicates a more

positive attitude towards aging. The internal consistency of the ATOA in this study was acceptable (Cronbach’s  $a = .73$ ).

## Self-perceptions of aging(AgeCog)

To measure self-perceptions of aging, the Personal Aging Experiences (AgeCog) Scale developed by Steverink et al. (2001) was used in this study. This scale consists of three domains: ongoing development (e.g., “Aging means to me becoming more and more competent”), physical decline (e.g., “Aging means to me being less energetic and fit”), and social loss (e.g., “Aging means to me that others do not need me so much anymore), and includes a total of 12 items. The scale is rated on a 4-point Likert scale (1 = *not at all* to 4 = *very much*), with higher total scores for each subscales indicating that aging is perceived as leading to ongoing development, physical decline, or social loss. The reliability of the sub-factors used in this study was acceptable to good (Cronbach’s  $a = .81, .83, \text{ and } .79$ , respectively).

## Subjective Well-being

To measure the subjective well-being of the participants, we used the Concise Measure of Subjective Well-Being (COMOSWB) developed by Suh and Koo (2011) for Koreans. The scale



consists of nine items divided into three subscales: life satisfaction (three items), positive affect (three items), and negative affect (three items). The scale is rated on a 7-point Likert scale (1 = *never* to 7 = *always*). The COMOSWB is culturally sensitive because it includes items that measure not only individual satisfaction but also interpersonal relationships, which is important in East Asian culture. A higher score on the scale indicates higher satisfaction with life and greater frequency of positive and negative affect. The total score for subjective well-being was calculated by adding the satisfaction with life score and the positive affect score and subtracting the negative affect score. The reliability of the scale used in this study was .89 for satisfaction with life, .93 for positive affect, and .90 for negative affect.

### **Age Stereotypes**

Age stereotypes were measured using the Views on Aging scale developed by Kornadt and Rothermund (2011). This scale consists of eight domains (family and partnership, friends and acquaintances, religion and spirituality, leisure/civic commitment, personality, financial situation, employment, physical fitness, and appearance) and 27 items. Each item consists of a pair of statements with opposing content (e.g., older persons are lonely and alone; older persons are secured and integrated). Participants

rated each item on an 8-point Likert scale, with higher scores indicating more positive age stereotypes about aging. The reliability of each domain was satisfactory to excellent (Cronbach's  $\alpha$  ranged from .62 to .90).

### **Statistical analysis**

Statistical analyses were conducted using SPSS 26 and AMOS 20. The validity of the K-AARC was assessed using both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The sample was randomly split into two halves for the EFA and CFA procedures, as previously described. For the analysis, behavioral domain scores were used instead of item scores for two reasons. First, the items measuring each behavioral domain were designed to reflect multiple concepts, such as depression, motivation, loneliness, and anxiety about future in the social-cognitive and social-emotional functioning domains. The second reason is to enable comparison with previous studies (Brothers et al., 2019; Sabatini et al., 2020). By using domain scores rather than items scores, consistent with prior research, the psychometric properties of the AARC and K-AARC can be compared from a cross-cultural perspective. Convergent and divergent validity were assessed by examining the correlation between the K-AARC and the subjective age, ATOA, AgeCog, subjective

well-being, and age stereotype scales. We conducted a William's t-test to examine whether the correlation coefficients between subjective aging scales and AARC losses were stronger than those with AARC gains, as found in prior research.

## Results

### Exploratory Factor Analysis

EFA was performed on the calibration

samples ( $n=214$ ). The factor structure was extracted and rotated using the principal axis factoring and direct oblimin methods, respectively. The EFA results showed that there were two factors with eigenvalues greater than 1, and this two-factor AARC structure was ideal according to the scree plot and parallel test results (Table 3). These two factors explain 69.75% of the variance. The pattern matrix revealed that Factor 1 had five negative domains with factor loadings ranging from .64 to .89, which were interpreted as

Table 3.

*Factor loadings, communalities, and item-total correlations by exploratory factor analysis*

	Rotates factor loadings		Reliabilities		
	Factor 1 "Losses"	Factor 2 "Gains"	Communalities	Cronbach's $\alpha$	Item-total correlations
AARC subscales					
Gains(+)					
PHYS+		.66	.47	.73	.40-.57
COG+		.74	.56	.74	.36-.65
INT+		.80	.66	.78	.46-.66
SC/SE+		.87	.78	.72	.39-.53
LIFE+		.76	.59	.75	.45-.59
Losses(-)					
PHYS-	.78		.62	.83	.53-.70
COG-	.79		.62	.76	.27-.64
INT-	.64		.43	.80	.54-.67
SC/SE-	.85		.76	.82	.51-.69
LIFE-	.89		.80	.66	.36-.48
Factor statistics					
Cronbach's $\alpha$	.89	.87			
Item-total correlations	.61-.83	.58-.74			
Eigenvalue	3.78	3.20			
%Variance	37.75	32.00			

*Note.* Analyses were performed using a calibration sample, a randomly selected half of the sample ( $N=215$ ). PHY=Health and Physical Functioning; COG=Cognitive Functioning; SC/SE, Social-Cognitive and Social-Emotional Functioning; INT=Interpersonal Function; LIFE=Lifestyle and engagement. "+"=gains factor; "-"= losses factor.

“perceived age-related losses.” Factor 2 had five behavioral domains that related to positive age-related changes with factor loadings ranging from .66 to .87, which were interpreted as “perceived age-related gains”. The correlation coefficient between the two factors was small and positive ( $r = .22$ ,  $p = .003$ ), which indicates a lower correlation than the correlation reported by Brothers et al. ( $r = .40$ ), suggesting a weak relationship between the two factors.

### Confirmatory Factor Analysis

To generalize the two-factor model derived from the EFA, a cross-validation sample ( $n=196$ ) was used to perform CFA using AMOS (version 20) with maximum likelihood estimation. To evaluate model fit, the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and root mean square error of approximation (RMSEA) were examined. Generally, CFI and TLI  $> .90$  and RMSEA  $< .10$  are acceptable model fits (Byrne, 2012; Hair

et al., 1998). The absolute skewness and kurtosis values of the measured variables were less than 1.0. The hypothesized two-factor model demonstrated a poor fit (Table 4). Based on the modification indices and a previous study, we included cross-loadings between PHYS+ and AARC losses, resulting in an improved chi-square statistic of the model fit from 184.29 to 129.55. This suggests that in the Korean population, PHYS+ items can be counted in both AARC gains and losses as individuals with poor health conditions may also be motivated to care about their health. Despite the inclusion of the cross-loading, the model fit remained unacceptable. To explore possible hidden relationships within the data, we added two correlated error terms to the modification model: PHYS- with COG-; PHSY- with INT-. This modification improved the model fit to an acceptable level based on the modification index. Considering the small size of the path coefficients from PHYS+ in AARC-losses and the structural coefficient of PHYS+ for AARC-losses in EFA, it was

Table 4.  
*Goodness-of-fit indices of confirmatory factor analyses*

	$\chi^2$	<i>df</i>	$\Delta \chi^2$	<i>df</i>	<i>p</i>	CFI	TLI	RMSEA
Baseline model: two-factor model of AARC	184.29	34	-	-	-	.855	.808	.151
Two-factor model of AARC with adding path PHYS+ with AARC losses	129.55	33	54.74	1	<.001	.907	.873	.123
Final Two-factor model of AARC with domain score error terms correlated	78.86	31	50.69	2	<.001	.954	.933	.089

*Note.* CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation.

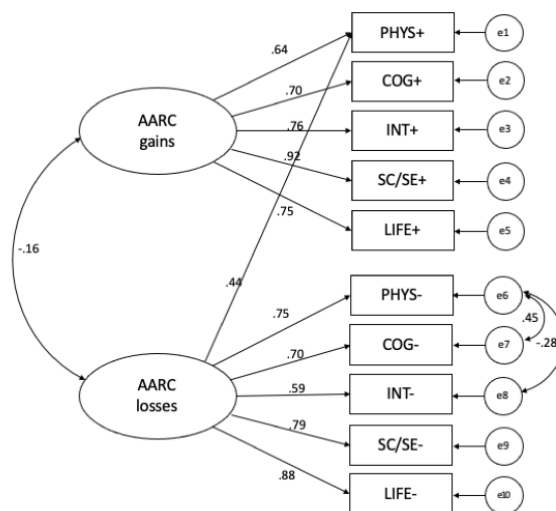
determined that the two-factor structure of the Korean version of the AARC questionnaire was stable (Figure 1).

### Convergent and Divergent Validity

To evaluate the convergent and divergent validity of the K-AARC questionnaire, correlation coefficients were calculated between the K-AARC scores and scores from subjective aging scales, such as felt age, ATOA, AgeCog, subjective well-being, and age stereotypes scales (see Table 5). Felt age was not significantly related to perceived age-related gains. Small but significant positive associations were found between AARC losses and the felt age. A moderate positive association was observed between AARC gains and the ATOA

scale, while a negative association was observed between AARC losses and ATOA. AARC gains was significantly related to the ongoing development of the AgeCog scale, but only weakly related to physical decline and no relationships were found between AARC gains and social loss. For AARC losses, however, moderate associations were observed for physical decline and social loss. Higher levels of perceived age-related gains were significantly related to higher levels of subjective well-being, such as life satisfaction and positive affect, reduced negative affect. Reversed relationships were observed between AARC losses and subjective well-being, although the associations were substantially smaller than they were for AARC gains. Inconsistent with the previous study, the magnitude of the associations with

Figure 1.  
Parameter estimates of two-factor model of the K-AARC.



subjective aging scales tended to be significantly stronger for AARC gains compared to AARC losses, except for some subscales such as felt age, physical decline, and social loss from AgeCog scale, as tested using William's *t*. To confirm the divergent validity, the correlation between the AARC scores and the eight domain scores from the age stereotypes scale was analyzed. The associations between the AARC and Age Stereotypes scale were small for all eight

domains, ranging from .13 to .31. Although AARC gains showed stronger associations than losses with religion/spirituality and personality, and associations comparable to losses with other domains, each value was less than .30. Although AARC gains and losses were significantly related to the Age Stereotypes scale in positive or negative directions, the association was weak. These results indicated that AARC has a distinct conceptual construct compared to the age stereotypes scale.

Table 5.  
*Pearson correlations between the K-AARC and other scales*

	AARC gains	AARC losses	William's <i>t</i> <sup>a</sup>
<b>Convergent validity</b>			
Felt age	-0.08	0.17***	-3.47***
ATOA	0.40***	-0.51***	16.59***
AgeCog scales			
Ongoing development	0.45***	-0.31***	12.55***
Physical decline	-0.07***	0.57***	-10.70***
Social loss	-0.10	0.59***	-12.08***
COMOSWB	0.51***	-0.41***	17.18***
Life satisfaction	0.49***	-0.30***	13.40***
Positive affect	0.48***	-0.33***	13.97***
Negative affect	-0.33***	0.44***	-12.93***
<b>Divergent validity</b>			
Age Stereotypes	0.30***	-0.28***	8.81***
Family and Partnership	0.31***	-0.29***	9.14***
Friends and Acquaintances	0.24***	-0.23***	6.96***
Religion and Spirituality	0.22***	-0.13**	5.00***
Leisure/Civic Commitment	0.26***	-0.25***	7.70***
Personality	0.30***	-0.16***	6.91***
Financial Situation	0.23***	-0.25***	6.99***
Employment	0.26***	-0.31***	8.64***
Physical Fitness/Appearance	0.22***	-0.25***	6.83***

<sup>a</sup> The test of the difference between two correlations.  
\*\**p* < .01, \*\*\**p* < .001

Table 6.

*Pearson correlations between the demographic variables and K-AARC for CFA sample (N=196)*

	gender	age	education	marital status	self-rated health
AARC gains	.20**	.16*	-0.06	-0.13	.35***
AARC losses	-0.03	-0.06	-0.11	0.03	-.44***

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 7.

*Means and standard deviations for K-AARC by age group and gender for CFA sample (N=196)*

		N	AARC gains	AARC losses
age	40-49	45	84.04(9.29)	81.64(12.47)
	50-59	49	87.10(1.41)	80.49(13.84)
	60-69	90	89.33(11.96)	77.23(15.88)
	70-87	12	86.9(11.01)	83.42(13.65)
gender	male	109	85.39(11.07)	79.86(14.23)
	female	87	89.93(10.62)	78.91(15.05)

### Correlations between Demographic Variables and K-AARC Scores

In Table 6, the correlations of K-AARC scores with demographic variables are shown. The results revealed that AARC gains were positively associated with age ( $r = .16$ ,  $p < .05$ ), gender ( $r = .20$ ,  $p < .001$ ), and subjective health ( $r = .35$ ,  $p < .001$ ). However, AARC losses were not significantly correlated with any of the other variables, except for a negative correlation with subjective health ( $r = -.44$ ,  $p < .001$ ).

Table 7 presents the means and standard deviations of K-AARC scores by age group and gender. To examine gender differences in AARC scores, additional analyses were

conducted. The results showed that women scored significantly higher in AARC gains than men ( $t = -2.91$ ,  $p < .01$ ), while no significant gender differences were found in AARC losses. Moreover, there were no significant differences in AARC gains and losses across age groups (all  $ps > .05$ ).

### Discussion

This study aimed to validate the AARC questionnaire developed by Brothers et al. (2019) in the Korean population aged 40 and over. Also, we investigated the convergent and divergent validity between K-AARC and scales measuring subjective aging including felt age, ATOA, AgeCog, subjective well-being and Age

Stereotypes scales.

The Korean version of the AARC was found to have a two-factor structure consisting of gains and losses, consistent with the results of Brothers et al. (2019). Examination of the subscales revealed that AARC gains and losses reflected five behavioral domains in line with the validation study of Americans by Brothers et al. (2019) and with AARC validation studies conducted in various countries (Neri et al., 2021; Sabatini et al., 2020; Testad et al., 2022).

Interestingly, the path coefficients from AARC losses to physical functioning gain were significantly positive in this study. This result is different from that of Brothers et al. (2019) but consistent with the Norwegian version of the validation study by Testad et al. (2022). Testad and colleagues (2022) suggested that perceived age-related changes as losses can influence healthy behaviors, such as investing time exercising or adjusting one's diet to maintain health. From this perspective, it is likely that Korean middle-aged and older adults may recognize a decline in physical functioning as they age but also make efforts to prevent diseases and lead a healthier life (Sabatini et al., 2022). This result found in both Norway and Korea could be attributed the availability of accessible and affordable healthcare services in both countries, which likely plays a role in enabling older adults to prioritize health maintenance. The similarity of the findings in

both Norway and Korea may be attributed to the availability of accessible and affordable healthcare services in both countries, which likely enables older adults to prioritize health maintenance. As a result, if older adults in Norway and Korea perceive age-related physical changes as losses, they may be more inclined to use medical services actively and without feeling as much economic burden compared to older adults in the United States (Osborn et al., 2017). Furthermore, the concern for one's own health may be associated with both AARC gains and losses, as indicated by previous studies (Miche et al., 2014; Testad et al., 2022).

Our results contrast with those of the study by Nam and Kim (2022), who validated the AARC for the Korean population aged  $\geq 65$  years. In their study, AARC gains do not have behavioral domains and AARC losses are composed of two behavioral domains (health and non-health). This difference may be due to the fact that Nam and Kim (2022) used item scores rather than behavioral domain scores, while the current study conducted factor analyses on behavioral domain scores like previous studies (Little et al., 2013). In the study conducted by Nam and Kim (2022), a factor analysis was performed on the 50 items of original AARC scale to perform item and factor analysis, which resulted in the development of a final questionnaire consisting of 14 items. However, the significant reduction

in the number of items compared to the original version of AARC may pose difficulties in utilizing the validated scale for cross-cultural purposes in other countries or cultures. In this study, the primary factors of the AARC(Brothers et al., 2019) were retained, and 10 behavioral domains measured by the 50 items were used as measurement variables. Exploratory and confirmatory factor analyses were conducted to verify if the secondary factor structure matched previous studies. As such, the validated questionnaire in this study is suitable for cross-cultural research purposes. The results of this study differed from those of Nam and Kim, which may be due to the fact that the current study included a wider age range that encompassed both middle-aged and older adults. This broader age range may have influenced the findings and contributed to the differences between the two studies. Moreover, the current study included participants in their 40s or older, not just elderly, making it a broader examination of AARC.

The results of analyzing the convergent and divergent validity of the Korean version of the AARC and the existing subjective aging scales are as follows: First, there was no significant association between AARC gains and subjective age. However, there was a significant positive association between AARC losses and subjective age. This indicates that because individuals perceive age-related change as

losses, they perceive their subjective age to be older. This result is partially consistent with previous studies (Brothers et al., 2015; 2019). Second, perceiving age-related change as either gains or losses was related to having positive or negative attitude towards aging, respectively, aligning with previous studies (Brothers et al., 2016; 2017). Third, the correlation analysis between the AARC and AgeCog scales showed a positive relationship between AARC gains and ongoing development, and a negative relationship between AARC losses and ongoing development. This suggests that perceived AARC gains are associated with a greater potential for development in the aging process, whereas perceived AARC losses are associated with a lower potential for development in old age. AARC losses showed a positive correlation with physical decline and social loss. These results are in line with previous research that reported that AARC losses are related to physical decline (Sabatini et al., 2020; Wurm et al., 2013) and difficulties in interpersonal relationships (Brothers et al., 2017; 2019). Fourth, the results revealed a correlation between AARC and subjective well-being, where a higher levels of AARC gains correspond with elevated levels of subjective well-being, while greater AARC losses are linked to lower subjective well-being. This finding supports prior research that indicates AARC predicts older adults' emotional



experiences (Dutt & Wahl, 2016; Nam & Kim, 2022; Miche et al., 2014). Finally, there was a positive relationship between AARC gains and positive age stereotypes across all eight domains, and a negative relationship between AARC losses and negative age stereotypes across all eight domains. This contrast with the results of the study by Brothers et al. (2019), which found that AARC gains only had significant relationships with some of the domains, but not all. The findings in this study, as well as in previous studies by Brothers et al. (2015; 2019), suggest that there is low correlation between AARC and the eight domains of age stereotypes. This indicates that the AARC questionnaire measures a distinct nature of perception of aging compared to the age stereotypes scales.

Thus, our findings suggest that there may be a discrepancy between general age stereotypes and an individual's personal awareness of aging. This highlights the utility of the AARC as a tool for evaluating an individual's own views on aging, distinct from commonly held age stereotypes (Brothers et al., 2015; Meisner, 2012).

The significance of this study lies in its validation of the AARC in middle-aged and older individuals in Korea. During middle age, preparing for old age can have an impact on both the fear of aging and psychological well-being in later life (Kim, 2020). Given

Korea's rapid aging population, investigating the perception of aging among middle-aged adults can aid in better preparation for later life. The current study is noteworthy in its validation of the AARC, which can assess the individual's awareness of aging in a comprehensive and multi-faceted manner, among adults in the Eastern population. As previous research demonstrated (Brothers et al., 2019; Meisner, 2012), positive and negative stereotypes of aging can have a significant impact on an individual's life, making a multidirectional and multidimensional approach to measuring subjective experiences of aging even more important.

This study has some limitations that must be considered when interpreting its results. First, the sample was primarily recruited through an online survey, which has the advantage of recruiting a diverse group of participants but has the limitation of only including individuals who are able to use a computer. To fully capture the diversity of awareness of aging, future studies should use a wider range of recruitment methods. Second, while conducting an online survey, it was found that participants included had relatively high levels of education, indicating a limitation in the study. Given that education can act as a protective factor against negative outcomes associated with aging, it is crucial to include participants with diverse educational backgrounds in future studies to

ensure the replicability of the research findings. Third, as this study was cross-sectional in nature, it was not able to capture changes in awareness of age-related change over time. Longitudinal research is needed to better understand how subjective aging change with age. Lastly, although we recruited both middle-aged and older adults, the number of participants aged 70 years or older was relatively small compared to other age groups. Future studies should aim to achieve a more balanced sample size across all age groups. These limitations highlight the need for continued research in this area to gain a deeper understanding of the complexities surrounding awareness of age-related change.

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# 한국판 연령 관련 변화에 대한 인식 척도 타당화: 중년 및 노인을 대상으로<sup>†</sup>

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주관적 노화 인식은 노년기 신체기능 뿐 아니라 웰빙에도 영향을 미치는 것으로 알려져 있다. 그러나 기존의 노화 인식 척도들은 노화 인식의 일부 측면만을 측정하는 한계가 있다. 본 연구는 중·장년층의 주관적 노화 인식을 종합적으로 측정하기 위해, Brothers등(2019)이 개발한 다차원적인 연령 관련 변화에 대한 인식(Awareness of Age-Related Change: AARC) 척도를 한국판으로 변안하고 타당화를 실시하였다. 연구 대상은 40세 이상의 중·장년 411명(남 234명, 여 166명)으로, K-AARC 척도의 요인구조, 수렴 및 변별타당도를 검증하였다. 또한, 주관적 연령, 노화에 대한 태도, 노화인식 척도, 단축형 행복척도와 연령에 따른 고정관념 척도를 함께 실시하였다. 탐색적 요인분석 결과, 이전 연구들과 일치하게 연령 관련 변화에 대한 인식은 크게 ‘손실’과 ‘이득’의 2요인 구조로 분류됨을 확인하였다. 확인적 요인분석에서 2요인 구조의 적합도지수가 양호하지 않았으나, 이득 요인의 하위 요인인 건강 및 신체기능 점수와 손실 요인 간 경로계수를 추가하고 손실 요인 내 오차상관을 고려한 2요인 모형에서는 양호한 수준의 적합도 지수를 보였다. K-AARC 척도의 수렴 및 변별 타당도 검증 결과, 연령 관련 변화를 손실로 인식하는 경우 실제 나이보다 더 늙게 지각하고 노화에 대해 부정적인 태도를 보이며 노년기를 감퇴와 손실이 주를 이루는 시기로 인식하는 것과 관련이 있었다. 반면, 연령 관련 변화를 이득으로 인식하는 경우, 노년기를 지속적인 발전이 가능한 시기로 인식하고 삶에 대한 만족도가 높으며, 긍정 정서를 더 자주 느끼는 것과 관련이 있었다. 또한, K-AARC 척도는 연령 고정관념 척도와는 낮은 수준의 상관을 보였는데, 이는 자신의 노화와 타인의 노화에 대한 인식이 개념적으로 구분될 수 있음을 보여준다. 본 연구의 결과는 K-AARC 척도가 중년 및 노인의 연령 관련 변화에 대한 주관적 인식을 측정하는데 타당하고 유용한 도구임을 시사한다.

주요어: 연령 관련 변화에 대한 인식, 주관적 노화, 노인, 타당화

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### <부 록>

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전혀 아니다	약간 아니다	보통이다	약간 그렇다	매우 그렇다
1	2	3	4	5

\* 어떤 문항이 자신의 경험을 매우 많이 반영한다면, “매우 그렇다”에 해당하는 5에 표시하면 됩니다.

\* 어떤 문항이 자신의 경험을 전혀 반영하지 않는다면, “전혀 아니다”에 해당하는 1에 표시하시면 됩니다.

\* 어떤 문항이 자신의 경험을 “조금” 이상 또는 “조금”보다 적게 반영한다면, “보통이다”에 해당하는 3에 표시하면 됩니다.

각 문항에 정답이 있는 것은 아니오니 자신의 개인적인 경험과 솔직한 의견에 따라 답해주시기 바랍니다.

다음 장으로 넘어가 척도에 응답하시기 바랍니다.



	나이가 들어가며 나는 _____라고 느낀다.	전혀 아니다	약간 아니다	보통 이다	약간 그렇다	매우 그렇다
1	다른 사람들이 나를 더 정중하게 대한다	1	2	3	4	5
2	무슨 일을 하든 시간이 더 오래 걸린다	1	2	3	4	5
3	내 지적인 능력이 떨어지고 있다	1	2	3	4	5
4	미래에 대한 걱정이 많아진다	1	2	3	4	5
5	내 건강에 대해 더 신경을 쓴다	1	2	3	4	5
6	내 주변 사람들과 인간관계에 더욱 감사하다	1	2	3	4	5
7	이전보다 움직이는 능력이 떨어진 것 같다(걷기, 의자에서 일어나기 등)	1	2	3	4	5
8	내 하루 일과를 보다 적극적으로 계획한다	1	2	3	4	5
9	생각하는 속도가 느려졌다	1	2	3	4	5
10	나에게 필요한 것이 무엇인지 더 잘 안다	1	2	3	4	5
11	사람들이 가끔 나를 투명인간 취급한다	1	2	3	4	5
12	사람과 사물을 평가할 수 있는 경험과 지식이 늘었다	1	2	3	4	5
13	죽음에 대한 생각이 늘었다	1	2	3	4	5
14	나에게 중요한 것이 무엇인지 더 잘 안다	1	2	3	4	5
15	삶을 더 즐기려고 노력한다	1	2	3	4	5
16	점점 더 세상에서 소외되어 간다	1	2	3	4	5
17	점점 더 집중하는 것이 어려워진다	1	2	3	4	5
18	내가 가진 것에 대해 감사한다	1	2	3	4	5
19	우정과 인간관계가 더 단단해졌다	1	2	3	4	5
20	이전보다 기운이 없다	1	2	3	4	5
21	앞을 내다보는 안목이 늘었다	1	2	3	4	5
22	더 자주 쉴 필요가 있다	1	2	3	4	5
23	더 나답게 행동하려는 것 같다	1	2	3	4	5

	나이가 들어가며 나는 _____라고 느낀다.	전혀 아니다	약간 아니다	보통 이다	약간 그렇다	매우 그렇다
24	더 자주 슬프다	1	2	3	4	5
25	건강에 좋은 음식을 먹는 것에 더 신경을 쓴다	1	2	3	4	5
26	새로운 것을 배우는 데에 더 많은 시간과 노력이 필요하다	1	2	3	4	5
27	내 체력과 신체능력(균형, 민첩성, 지구력 등)이 예전 같지 않다	1	2	3	4	5
28	예전만큼 많은 것을 하지 않는다	1	2	3	4	5
29	건강과 체력관리에 더 시간을 투자한다	1	2	3	4	5
30	다른 사람들이 내가 일을 하는 능력이 부족하다고 생각하여 대신 그 일을 해준다	1	2	3	4	5
31	내 여가생활을 즐기는 시간이 많아졌다	1	2	3	4	5
32	경제적으로 불안정하다	1	2	3	4	5
33	어떤 결정을 내리기 전에 필요한 정보를 더 많이 수집한다	1	2	3	4	5
34	다른 사람들이 내 앞에서 (말하는 것이 편치 않아서) 말수가 줄어든다	1	2	3	4	5
35	규칙적으로 운동하는 것에 더 신경을 쓴다	1	2	3	4	5
36	몸 아픈 곳이 더 많아졌다	1	2	3	4	5
37	많은 것들을 더 깊게 즐긴다	1	2	3	4	5
38	더 자주 깜빡하거나 잊어버린다	1	2	3	4	5
39	다른 사람들에게 마음을 더 연다	1	2	3	4	5
40	내가 원하는 대로 살 자유가 있다	1	2	3	4	5
41	자신감이 높아졌다	1	2	3	4	5
42	다른 사람들의 도움에 더 의지한다	1	2	3	4	5
43	잠을 충분히 자려고 신경 쓴다	1	2	3	4	5
44	더 지혜로워졌다	1	2	3	4	5

	나이가 들어가며 나는 _____라고 느낀다.	전혀 아니다	약간 아니다	보통 이다	약간 그렇다	매우 그렇다
45	다른 사람들이 나를 참을성 있게 대하지 않는다	1	2	3	4	5
46	활동을 줄여야 한다	1	2	3	4	5
47	내 스스로 동기부여하기가 어렵다	1	2	3	4	5
48	내가 아무런 일도 못하게 된다면 어떨지 걱정된다	1	2	3	4	5
49	매사에 신중해진다	1	2	3	4	5
50	가족이 나에게 더 소중해졌다	1	2	3	4	5

ENG	KOR	Item Numbers
GAIN	획득	1, 5, 6, 8, 10, 12, 14, 15, 18, 19, 21, 23, 25, 29, 31, 33, 35, 37, 39, 40, 41, 43, 44, 49, 50
LOSS	상실	2, 3, 4, 7, 9, 11, 13, 16, 17, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 42, 45, 46, 47, 48

획득의 하위 문항 : 문항들의 총합으로 계산

PHYS+	건강 및 신체기능	5, 25, 29, 35, 43
COG+	인지기능	12, 21, 33, 44, 49
INT+	대인관계	1, 6, 19, 39, 50
SOC+	사회인지 및 사회정서기능	10, 14, 18, 23, 41
LIFE+	삶의 방식과 참여도	8, 15, 31, 37, 40

상실의 하위 문항 : 문항들의 총합으로 계산

PHYS-	건강 및 신체기능	7, 20, 22, 27, 36
COG-	인지기능	3, 9, 17, 26, 38
INT-	대인관계	11, 30, 34, 42, 45
SOC-	사회인지 및 사회정서기능	4, 13, 16, 24, 47
LIFE-	삶의 방식과 참여도	2, 28, 32, 46, 48