

## Nearing Old Age: Technological Aging

## Yaşlanmaya Ramak Kala: Teknolojik Yaşlanma

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## ABSTRACT

**Objective:** The study aimed to determine the Awareness of age-related change (AARC) and attitudes of adults between the ages of 40-64 years towards artificial intelligence (AI).

**Materials and Methods:** It was conducted in a descriptive and correlational type. The study included 255 individuals aged 40-64 years, who were not bedridden and had no neuropsychiatric problems. The data for this study were collected using a personal information form, the AARC scale, and the General Attitudes Towards Artificial Intelligence Scale (GAAIS). Data were analyzed using the SPSS 25 software package. The Skewness-Kurtosis test was used to check the normality of distribution. Correlation analysis was performed for the connection between the scale total scores and sub-dimension scores.

**Results:** The majority (79.2%) of the participants thought positively about aging, 71.8% were afraid of the stigma of old age, 67.1% had positive attitudes towards AI, and 91.4% used AI tools. When the participants' scale scores were examined, it was determined that the average AARC Gains score was 19.55±3.31 (5-25), the average AARC Losses score was 13.71±3.89 (5-25), and the average GAAIS score was 62.74±15.60 (23-98). It was determined that the connection between the participants' AARC Gains and GAAIS ( $r=0.152$ ) was positive and significant. It was also determined that there was no connection between AARC Losses and GAAIS ( $r<0.001$ ).

**Conclusions:** It is recommended that the views of adults aged 40 years and over, who are nearing old age, be increased, their awareness be raised, and training be organized to improve their attitudes towards AI.

**Keywords:** Aging, artificial intelligence, awareness of age-related changes, technology

## ÖZ

**Amaç:** Çalışmada 40-64 yaş arası yetişkinlerin yaşa bağlı değişim farkındalığını (YBDF) ve yapay zekaya (YZ) yönelik tutumlarını belirlemek amaçlanmıştır.

**Materyal ve Metot:** Tanımlayıcı ve ilişki arayıcı türde yürütülmüştür. Çalışmaya 40-64 yaş aralığında, yatağa bağımlı olmayan ve nöropsikiyatrik problemi olmayan 255 birey dahil edildi. Bu çalışma için veriler kişisel bilgi formu, Yaşa Bağlı Değişim Farkındalığı Ölçeği (YBDFÖ) ve Yapay Zekaya Yönelik Genel Tutum Ölçeği (YZYGTÖ) kullanılarak toplanmıştır. Veriler SPSS 25 yazılım paketi kullanılarak analiz edilmiştir. Dağılımın normalliğini kontrol etmek için Skewness-Kurtosis testi kullanılmıştır. Ölçek toplam puanları ile alt boyut puanları arasındaki ilişkiler için korelasyon analizi yapılmıştır.

**Bulgular:** Katılımcıların %79.2'si yaş almayı olumlu olarak düşünmekte, %71.8'inin yaşlılık damgalamasından korkmakta, %67.1'inin yapay zekaya yönelik olumlu tutum sergilemekte ve %91.4'ünün yapay zeka araçlarını kullanmaktadır. Katılımcıların ölçek skorları incelendiğinde YBDFÖ-Kazanç puan ortalaması 19.55±3.31 (5-25), YBDFÖ-Kayıp puan ortalaması 13.71±3.89 (5-25) ve ZYGTÖ puan ortalamasının ise 62.74±15.60 (23-98) olduğu belirlenmiştir. Katılımcıların YBDFÖ-Kazanç ile ZYGTÖ ilişkisinin ( $r=0.152$ ) pozitif yönde ve anlamlı olduğu saptanmıştır. YBDFÖ-Kayıp ile ZYGTÖ ilişkisinin de olmadığı ( $r<0.001$ ) belirlenmiştir.

**Sonuç:** Yaşlanmaya ramak kala olan 40 yaş ve üzeri yetişkin bireylerin yaşlanmayla ilgili pozitif görüşlerinin artırılması, yapay zekaya yönelik tutumlarının iyileştirilmesi için farkındalıklarının oluşturulması ve eğitimlerin düzenlenmesi önerilmektedir.

**Anahtar Kelimeler:** Teknoloji, yapay zekâ, yaşa bağlı değişim farkındalığı, yaşlanma

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## INTRODUCTION

It is predicted that the number of older people in the world, which is currently one billion, will be approximately two billion by 2050<sup>1</sup> and that older people in our country, which is 10.6%, will increase even more in coming years. In such case,<sup>2</sup> it becomes important to be prepared for old age before aging. It is important to know the age-related change awareness attitudes of adults. Awareness of age-related change (AARC) is defined as awareness that person's behavior, performance level, or way of experiencing life changes as a result of aging.<sup>3,4</sup> Adults may have positive or negative attitudes, prejudices, concerns, and hopes towards aging. Their self-perception and views on lifestyle towards these situations may vary from individual to individual.<sup>3,5</sup> The concept of AARC has featured regularly in international literature in recent years,<sup>6-9</sup> but it is still very new in national literature.<sup>4</sup>

Considering the advancements in technology, it is becoming important that older people in society can use artificial intelligence (AI) tools. The use of many technological tools and AI by individuals while continuing their daily lives will make their lives easier.<sup>10</sup> It has become essential for individuals to use these current approaches, which include many AI algorithms, in mobile applications, accessing health services online, using health equipment technologies, and using wearable technology.<sup>11,12</sup> For society that can live healthy, long, and quality life, it is indispensable for adults to adapt to technologies that are products of AI. In this respect, adults' attitudes towards AI have an important place in both national and international literature.<sup>13-18</sup>

Given that it is important for adults to be prepared for old age and to be able to use applications that will make their lives easier, their thoughts and needs regarding these issues need to be determined.<sup>4</sup> To facilitate adults' awareness and adaptation to digital age, it is first necessary to determine individuals' perceptions of AARC and their attitudes towards AI.<sup>19</sup>

In this context, the study aimed to determine the AARC and attitudes of adults between the ages of 40-64 years towards AI.

## MATERIALS AND METHODS

**Ethical Aspects of the Research:** A university's Ethics Committee granted permission to conduct research (Date: 15.03.2024, decision no: 2024/94). Research conforms to provisions of Declaration of Helsinki. Permission was obtained from scale owners via e-mail to use scales in research. Consents of volunteer adults who participated in study were obtained via an online consent form.

**Type of Research:** Research was conducted in a

descriptive and correlational type to determine AARC (gain and loss situations) and attitudes towards AI of adults aged 40-64 years. STROBE checklist was used in reporting of research.<sup>20</sup>

**Research Questions:** (1) What is the AARC among adults aged 40-64 years? (2) What are the attitudes of adults aged 40-64 years towards AI? (3) Is there a connection between the AARC among adults aged 40-64 years and their attitudes towards AI?

**Population and Sample:** Population of this research consisted of adults aged 40-64 years living in Türkiye. G\*Power program was used in sample calculation of research. It was determined that a minimum of 138 individuals should be studied in study, assuming that connection between AARC and attitudes towards AI of adults aged 40-64 years was at a moderate level ( $r=0.30$ ). Of 279 individuals who participated in survey, 10 did not give consent, 13 were not included in study because they were under 40 years, and one was not included because they were over 65 years. Research was completed with a total of 255 individuals. When the data collection process was completed, a post-hoc analysis was performed by entering sample size as 255, correlation coefficient as 0.152 and type 1 error (alpha coefficient) (0.05). As a result of post-hoc analysis, it was determined that researcher's power was 99%.

**Research Inclusion Criteria:** All individuals between ages of 40-64 years, who were not bedridden and had no neuropsychiatric problems, were included in study.

**Data Collection Method:** In this study, data were collected from adults aged 40-64 years using the snowball method via a data collection form created online via Google Drive in May 2024. Adult volunteers who participated in study were asked to read consent form prepared online, tick checkbox, and then answer the questions. When the informed consent form was clicked, form that opened was read. After consent was read, they were able to answer research questions after ticking option "I approve of participating in study". Individuals who did not consent were allowed to exit form without answering the questions.

**Data Collection Forms:** *Personal Information Form:* Information form was created by researchers in line with literature and included 12 questions.<sup>4,16,17,21,22</sup>

*Awareness of Age-Related Change Scale (AARC-10):* AARC refers to awareness that an individual's life has changed due to aging. Scale sub-dimensions, including two positive (AARC-gains) and negative (AARC-losses) aspects of their own aging experiences. Scale is a five-point Likert-type scale with 10 items. Individuals can respond to scale items ranging from not at all (1) to very much (5). An increase in

score indicates that AARC is high. Scale (AARC-10), developed by Kaspar et al.,<sup>23</sup> was adapted to Turkish by Genç et al.<sup>4</sup> Total Cronbach alpha (Cr  $\alpha$ ) value of AARC-10 scale was found as 0.717, loss factor was 0.806, and gain factor was 0.642.<sup>4</sup> In present study, total Cr  $\alpha$  value of AARC-10 was determined as 0.71, AARC Losses factor was 0.77, and AARC Gains factor was 0.70.

*The General Attitudes Towards Artificial Intelligence Scale (GAAIS):* A Scale developed by Schepman and Rodway<sup>19</sup> was adapted to Turkish by Kaya et al.<sup>24</sup> Scale has two sub-dimensions and 20 questions: negative attitudes towards AI and positive attitudes towards AI. There are 12 positive and eight negative items. Scale score is calculated by reverse coding eight items towards AI. Individuals can respond to scale items from strongly disagree (1) to strongly agree (5). Total possible score from scale is 100, and increase in scale score means more positive attitude towards AI. Cr  $\alpha$  values were determined as 0.82 for positive attitudes and 0.84 for negative attitudes.<sup>24</sup> In present study, Cr  $\alpha$  values were determined as 0.93 for positive attitudes, 0.90 for negative attitudes, and 0.92 for total attitudes.

**Data Analysis:** Data were analyzed using IBM SPSS Statistics 25 software package. Personal data and scale scores are in Tables 1 and 2. Correlation analysis was performed for connections between scale total scores and sub-dimension scores. A normality test was performed to decide on type of correlation analysis (Pearson correlations). Normality of data distribution was determined using Skewness-Kurtosis values of between -1.5 and +1.5, and research data was found to be normally distributed. Significance level was taken as  $p < 0.05$ .

**RESULTS**

Average identity age of participants was  $52.60 \pm 7.82$  (40-68) years, and average age they felt was  $42.34 \pm 12.17$  (16-80) years. Of participants, 59.2% were female, 84.7% were married, 76.5% were university graduates, and 40.8% were working full time. It was determined that 63.9% of participants had no chronic disease and 55.7% did not use regular medication. Majority (79.2%) of participants thought positively about aging, 71.8% were afraid of stigma of old age, 67.1% had positive attitudes towards AI, and 91.4% used AI tools (Table 1).

**Table 1.** Characteristics of people aged 40 and over (n=255).

Characteristics	Date	
Identity age, Mean $\pm$ SD / Median (Min-Max)	52.60 $\pm$ 7.82 / 53 (40 – 68)	
Perceived age, Mean $\pm$ SD / Median (Min-Max)	42.34 $\pm$ 12.17 / 42 (16 – 80)	
Sex, n (%)	Male	104 (40.8)
	Female	151 (59.2)
Marital status, n (%)	Single	39 (15.3)
	Married	216 (84.7)
Education status, n (%)	Primary-Secondary Education	25 (9.8)
	High School	35 (13.7)
	University	195 (76.5)
Employment status, n (%)	Full time	104 (40.8)
	Part-time	24 (9.4)
	Retired	69 (27.1)
	Unemployed	13 (5.1)
Chronic illness, n (%)	Other	45 (17.6)
	Yes	92 (36.1)
Continuous use of medication, n (%)	No	163 (63.9)
	Yes	113 (44.3)
Thinking positively about ageing, n (%)	No	142 (55.7)
	Yes	202 (79.2)
Fear of stigmatisation of old age, n (%)	No	53 (20.8)
	Yes	72 (28.2)
Attitude towards artificial intelligence, n (%)	No	183 (71.8)
	Positive	171 (67.1)
Using artificial intelligence tools, n (%)	Negative	84 (32.9)
	Yes	233 (91.4)
	No	22 (8.6)

When the participants' scale scores were examined, it was determined that average AARC Gains score was  $19.55 \pm 3.31$  (5-25), average AARC Losses score was  $13.71 \pm 3.89$  (5-25), and average GAAIS score was  $62.74 \pm 15.60$  (23-98) (Table 2). Total AARC and GAAIS scale scores and sub-dimensions are presented in Table 3. It was deter-

mined that connection between participants' AARC Gains and GAAIS ( $r=0.152$ ,  $p=0.015$ ,  $n=255$ ) was positive, weak, and significant. It was also determined that there was no connection between AARC Losses and GAAIS ( $r<0.001$ ,  $p=0.995$ ,  $n=255$ ) (Table 3).

**Table 2.** Data on scale scores.

	Mean $\pm$ SD	Median (Min-Max)
AARC_Gains	$19.55 \pm 3.31$	20 (5 – 25)
AARC_Losses	$13.71 \pm 3.89$	14 (5 – 25)
GAAIS	$62.74 \pm 15.60$	64 (23 – 98)

AARC: Awareness of Age-Related Change Scale; GAAIS: The General Attitudes Towards Artificial Intelligence Scale.

**Table 3.** The relation between the total GAISS, AARC Gains, AARC Losses.

		Total_GAISS	AARC_Gains	AARC_Losses
Total_GAISS	r	1		
	p			
AARC_Gains	r	0.152	1	
	p	<b>0.015</b>		
AARC_Losses	r	<b>0.001</b>	0.127	1
	p	0.995	<b>0.043</b>	

r: Pearson Correlation; p: Sig. (2-tailed); AARC: Awareness of Age-Related Change Scale; GAAIS: The General Attitudes Towards Artificial Intelligence Scale.

### DISCUSSION AND CONCLUSION

In this study, which was conducted to determine AARC of adults aged 40 years and over, their attitudes towards AI, and connection between them, it was found that individuals' AARC Gains scores were generally good and their attitudes towards AI were moderate. In addition, it was seen that there was a positive and significant connection between adults' AARC Gains scores and their attitudes towards AI.

Chronologic (identity) age refers to age measured from a person's birth to a certain date, and subjective age is related to how old a person feels.<sup>9</sup> Genç et al.<sup>4</sup> found that average age of individuals was  $53.4 \pm 10.4$  (40-92) years and average perceived subjective age was  $44.8 \pm 13.9$  (12-100) years. The present study was similar, finding that average chronologic age of individuals was  $52.60 \pm 7.82$  (40-68) years and average subjective age perception was  $42.34 \pm 12.17$  (16-80) years. Genç et al.<sup>4</sup> found that 68.9% of individuals had more positive aspects of aging, but this rate was determined to be higher (79.2%) in our study. Individuals' feeling of youth is related to their perspectives and expresses that they live in a healthy environment.

When the literature was examined, it was determined that average AARC Gains score was higher than average AARC Losses score in many stud-

ies.<sup>4,8,9,21,22</sup> Present study was similar to literature, and participants' views on aging were positive, thinking that gains of old age were higher. In addition, present study revealed that 71.8% of individuals were not afraid of stigma of old age. In this country, where healthy and active aging is at forefront, it is seen that it has positive effects on thoughts of individuals who will age. It is thought that older people are ready for natural process of aging due to reasons such as having a social health policy and knowing how to cope with problems of aging. It is thought that they are ready for natural process of old age due to reasons such as having a social health policy and knowing how to deal with possible situations.

Considering the mega trends echoing in gray revolution, technological transition and its obvious social transformations, the conceptual connection between old age and technology emerges.<sup>22,26</sup> Huxhold et al.<sup>26</sup> addressed the concept of gray digital divide in their study with individuals aged 40 years and over. According to Compaine,<sup>27</sup> digital divide is defined as 'perceived difference between those who have access to latest information technologies and those who do not'. Over time, the gray digital divide has determined that social inequalities have decreased. An important way to minimize the digital divide is attitudes of individuals towards AI. Considering these

situations, the attitudes of older individuals towards AI have been addressed with their AARC. Older individuals' views on aging may prevent use of technology. Older people may internalize negative age-related stereotypes about their ability to use technology and social media, which can hinder their efforts to use these technologies effectively. Reducing negative age-related stereotypes and self-perceptions about aging has potential to encourage the use of AI-based technologies and improve positive self-perceptions about aging.<sup>21</sup> Our study found that individuals who were not yet old had positive attitudes toward AI, in line with literature.

AI is an important phenomenon that has emerged with development of technology and affects life in many areas and offers opportunities.<sup>15,18</sup> Target group of this study was 40-64 years age group, which was not considered older people but is on verge of old age. Determining attitudes is a strong indicator of actual use and acceptance of individuals' attitudes towards AI technologies.<sup>15</sup> In this study, it was determined that individuals' attitudes towards AI were positive and almost all participants (91.4%) used AI tools. It is thought that reason for this situation is sex homogeneity of study group (59.2% female) and high level of education (76.5% university). Studies on AI also show that individuals have highly positive attitudes towards AI.<sup>13,16-18</sup> Despite these positive attitudes of individuals towards AI, it has been determined that they are sceptical about cooperating with AI<sup>17</sup> and that level of anxiety about AI increases with age.<sup>14</sup> Hong et al.<sup>13</sup> stated that although AI and its applications were socially accepted, it was a fact that older people abandoned them after short-term use. In addition, Fang and Sim<sup>28</sup> determined that attitudes towards lifelong learning played a role in shaping well-being of older people, especially their quality of life. Many factors, such as conditions offered to older people, their lifestyles, and order in which they exist affect their use of AI and change their attitudes towards it. For this reason, it is important to determine attitudes towards AI before aging, take precautions accordingly, and develop practical applications.

In present study, it was determined that there was a significant positive connection between adults' AARC Gains scores and their attitudes towards AI. Although positive correlation is statistically significant, its practical impact may be limited. No connection was found between AARC Losses scores and attitudes towards AI. In literature, there are two studies investigating connection between AARC and technology<sup>22</sup> and social media use.<sup>21</sup> Schlomann et al.<sup>22</sup> found that there was a positive connection between AARC Gains and technology skills and technology attitudes. Sabatini et al.<sup>21</sup> found that individuals' AARC Gains and social media use were posi-

tively correlated, but AARC Losses and social media use were not correlated. It has been emphasized that reducing negative views about aging can help increase interaction of middle-aged and older individuals with social media and encouraging social media use can encourage positive self-perceptions about aging.<sup>21</sup> It is desired/expected that attitudes about losses do not affect the results. Training should be provided in minimizing AARC Losses and it is recommended that it be converted to AARC Gains. It is recommended that initiatives be planned to increase positive attitudes and increase use of AI. Preparing individuals who are about to age technologically for old age will make their lives easier and increase their quality.

In conclusion, this study, which determined AARC in adults aged 40 years and over, their attitudes towards AI, and connection between them, found that individuals' AARC Gains scores were good, their attitudes towards AI were moderate, and there was a positive and significant connection between adults' AARC Gains scores and their attitudes towards AI. It is recommended that views of adults aged 40 years and over, who are nearing old age, be increased, their awareness be raised, and training be organized to improve their attitudes towards AI. In intervention studies, individuals' views on aging and their attitudes towards AI should be evaluated together. Because non-probability (snowball) sampling method was used, study findings can only be generalized to sample studied. In addition, scales used were based on self-reporting and were in line with individual's statement. Conducting research in online environment may have affected the results, considering that research was only conducted with individuals who had potential to use technology. Results should be interpreted with caution in terms of participation bias. Despite these limitations, research is important in terms of revealing adults' views on ageing, their attitudes towards AI and connection between the two. Research is pioneering for studies that will address individuals' views on aging and their attitudes towards AI.

**Ethics Committee Approval:** A university's Ethics Committee granted permission to conduct research (Date: 15.03.2024, decision no: 2024/94). Research conforms to provisions of Declaration of Helsinki. Permission was obtained from scale owners via e-mail to use scales in research. Consents of volunteer adults who participated in study were obtained via an online consent form.

**Conflict of Interest:** No conflict of interest was declared by the authors. The authors have no relevant financial or non-financial interests to disclose.

**Author Contributions:** Concept – FZG, AU; Supervision– FZG, AU; Materials – FZG; Data Collection

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