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“Wash Your Eyes, See Differently”: Visual Thinking Strategies and Ageism in Medical Students—A Single-Arm Quasi-Experimental Pretest–Posttest Study

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Abstract

Objectives

Ageism is prevalent among medical students and can lead to inequitable care and adverse health outcomes for the elderly. The aim of this study was to investigate the effectiveness of an educational intervention based on Visual Thinking Strategies (VTS) on reducing age stereotypes and ageist attitudes in medical students.

Methods

This single-arm, non-randomized quasi-experimental study used a pretest–posttest design and was conducted at Zahedan University of Medical Sciences in fall 2025. Of 110 eligible pre-internship students, 35 were selected by simple random sampling; all participants received the intervention. The intervention comprised three 90-min sessions delivered over three consecutive days and included guided VTS discussions of artworks related to aging, group poetry, and mask-making. The two outcomes were attitudes toward older people, measured with Kogan's Attitudes toward Older People Scale (KAOPS), and ageism, measured with the Ahmadi et al. scale. Outcomes were assessed immediately before and after the intervention. Pre–post differences were analysed using paired t tests.

Results

All 35 enrolled participants received the intervention, completed both assessments, and were included in the analysis. The mean KAOPS score increased from 103 ± 6.97 before the intervention to 121 ± 6.12 after the intervention ($p < 0.001$). The mean ageism score decreased from 141.7 ± 0.9 to 120.4 ± 1.4 ($p < 0.001$).

Conclusion

Participation in the short VTS-based educational intervention was associated with more positive attitudes toward older people and lower ageism scores. Because this was a small, single-arm study without a control group, the findings should be considered preliminary.

Trial registration

Iranian Registry of Clinical Trials (IRCT), [IRCT20190402043153N1], registered on [2026-07-30

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Introduction

The phenomenon of population aging is one of the greatest achievements and challenges of this century. Aging is a natural and inevitable process that, over time, entails numerous physical, psychological, and social changes, often accompanied by multiple long-term health problems and complex health care needs (1). According to statistics from the World Health Organization (WHO) and the United Nations Population Fund (UNFPA), the world's elderly population is increasing at an unprecedented rate. It is estimated that by 2050, the number of people over 60 years of age will reach two billion, up from 900 million in 2015 (2). In Iran, the phenomenon of population aging is occurring at a faster rate than the global average. Iran has the second fastest growing elderly population in the world, as measured by the expected increase in the percentage of the population over 60 years of age from 2015 to 2050. Specifically, Iran has the second fastest growth of elderly people after South Korea. The share of the elderly population (over 60 years of age) increased from 8.2% in 2016 to about 10.5% in 2021 and is projected to reach more than 30% by 2030 (3). The dramatic increase in life expectancy has confronted health systems with an increasing volume of elderly patients with complex and multidimensional needs. In such a context, the quality of health care is not limited to clinical competencies alone, but the attitudes and beliefs of health care providers play a decisive role (4). One of the greatest obstacles to providing quality care to Ageism is a phenomenon that affects older adults. Ageism refers to stereotypes (the way we think), prejudice (the way we feel), and discrimination (the way we act) toward others or ourselves based on age and is recognized by the WHO as one of the most prevalent yet least recognized forms of discrimination that has serious consequences for the physical and mental health of older adults (5). According to the WHO, about half of the world’s population holds ageist attitudes toward older adults. Studies have shown that in the United States, one dollar out of every seven dollars spent annually on eight costly diseases (a total of $63 billion) is attributed to ageism (2). Ageism also reduces the quality of life of older people, increases their social isolation and loneliness, and has serious and widespread consequences for the health, well-being, and human rights of individuals, including earlier death (ageism is associated with a 7.5-year reduction in life expectancy), poorer physical and mental health, slower recovery from disability in old age, and increased risk-taking behaviors such as unhealthy diet, excessive alcohol consumption, and smoking (6). Recent research shows that ageism is very common among health professionals and students. In health care settings, ageism can lead to less accurate diagnosis, ineffective communication, the provision of more limited treatment options, and the ignoring of important symptoms. Therefore, training a health workforce that is free from negative stereotypes associated with aging has become an undeniable priority in medical education (7). A 2020 systematic review found that in 85% of studies, age was a determining factor in access to medical treatments, and ageism can lead to a decrease in the trust of older people in the health system, which ultimately leads to a lack of timely referral for services and negative consequences on their health (8). Countering these attitudes and stigmas is an ethical and professional imperative and should be taught to medical students through targeted training. Traditional curricula in medical schools

often focus on the biomedical aspects of diseases and do not pay sufficient attention to the psychological, social, and cultural dimensions of aging. This approach not only does not help reduce ageism, but may even reinforce it (9). Studies in Iran also confirm this problem, and studies show that Iranian medical students face negative stereotypes towards aging. These findings emphasize the need for innovative and effective educational interventions (10).

Modern medical education is increasingly embracing humanistic approaches and the integration of humanities into educational curricula. Research evidence suggests that traditional curricula, despite covering the biomedical aspects of aging, often fail to change students' deeply ingrained attitudes toward the elderly, and that medical and other health professions students may implicitly or explicitly hold stereotypes of the elderly as "incompetent," "inflexible," and "decreased social value," which are not modified or even reinforced during clinical training (11). This gap highlights the need for innovative educational interventions that go beyond the transfer of theoretical knowledge to target the attitudinal and emotional layers of learning. In this regard, art-based approaches and reflective observation have emerged as a new trend in medical education that is linked to fostering empathy, tolerance of ambiguity, and critical thinking (12).

Visual Thinking Strategies (VTS) is a structured, evidence-based teaching method that develops observational skills, evidence-based reasoning, and cognitive flexibility through group discussion of artwork. In a VTS session, the facilitator uses open-ended, non-directive questions to invite participants to describe what they see in the image, provide visual evidence for their interpretation, and explore different perspectives. This process provides a safe space for expressing perceptions and confronting multiple interpretations, and helps learners become more aware of their conscious and unconscious assumptions (12). A review of studies in medical education suggests that VTS significantly improves clinical observation accuracy, patient empathy, and teamwork ability. The ability of VTS to challenge implicit biases and stereotypes is also theoretically justifiable, as exposure to diverse images and narratives expands the learner's reservoir of lived experiences and weakens stereotyped thinking (13).

However, there is a significant gap in the research literature: the specific application of VTS to reduce age stereotypes and ageism among medical students has rarely been empirically examined. While intergenerational contact-based interventions or formal gerontology education programs have shown inconsistent and often unstable results in changing attitudes, VTS has the potential to challenge ageist beliefs in a non-threatening and indirect way by engaging learners in a visual exploration and group discussion of images that portray aging in non-stereotypical, active, and multidimensional roles. However, to date, no study has been designed to rigorously assess the impact of a structured VTS intervention on medical students' explicit and implicit age stereotypes using validated psychometric instruments. This scientific gap at the intersection of medical education, social psychology, and health humanities necessitates the conduct of the present study. The importance of this study is that it provides, for the first time, empirical evidence on the effectiveness of VTS as a short-term, low-cost intervention that can be integrated into a busy medical curriculum in reducing ageism. The results can be the foundation for designing art-based educational programs with the specific goal of combating age

discrimination and can be considered an effective step towards training physicians with more positive attitudes and more equitable care for the growing elderly population. The objective of the present study was to assess pre–post changes in attitudes toward older people and ageism scores following a short VTS-based educational intervention in health professions students.

Methodology

This was a single-centre, single-arm, non-randomized quasi-experimental study with a pretest–posttest design, conducted in fall 2025. All enrolled participants received the educational intervention immediately after the baseline assessment; there was no comparator group and no random allocation to treatment groups. The study was conducted at Zahedan University of Medical Sciences, Zahedan, Iran. The source population comprised pre-internship students in medicine, nursing, physiotherapy, nutrition, and health during the first half of the 2025–2026 academic year. Inclusion criteria were enrolment in a pre-internship course in one of the specified disciplines, no regular contact with older adults, no employment in geriatric wards, no previous participation in a similar course, and willingness to participate. Exclusion criteria were failure to attend all intervention sessions, withdrawal of consent, failure to complete either the pretest or post-test, concurrent participation in a similar course, or transfer to another university during the study.

Patient and public involvement

Patients and members of the public were not involved in the design, conduct, or reporting of this educational study.

Changes after study commencement

“No important changes to the study methods, outcomes, or analyses were made after study commencement.”

Sampling

Eligible volunteers were stratified by discipline. Seven students were randomly selected within each of the five disciplinary strata, producing a balanced sample of 35 participants. Within each discipline, the seven selected students drew team numbers from 1 to 7; students with the same number formed an interprofessional team. This procedure randomly distributed one learner from medicine, nursing, physiotherapy, nutrition, and public health to each of the seven teams.

Sample size calculation

The target sample size was calculated a priori for a two-sided paired pretest-posttest comparison using Cohen's dz, defined as the expected mean within-participant change divided by the standard deviation of

the paired change scores. The effect-size estimate of dz = 0.66 was obtained from the preliminary 20-student implementation conducted before the analytic cohort.

Effect-size definition: Cohen's dz = mean paired change / standard deviation of paired changes.

Inputs: two-sided alpha = 0.05, statistical power = 0.95, and expected dz = 0.66; the noncentral t calculation required 32 complete pretest-posttest pairs.

With a two-sided alpha of 0.05, 95% power, and an expected standardised paired mean change of dz = 0.66, the required analysable sample was 32 participants. The recruitment target was increased by three participants (approximately 10%) to allow for incomplete assessments or withdrawal, yielding a target of 35. The dz estimate was derived from the preliminary 20-student implementation of the same educational programme. Of 140 students in the source population, 110 met the eligibility criteria and volunteered. Each eligible volunteer received a study code. Study Randomizer was used separately within each disciplinary list to select seven participants, resulting in 35 students. This procedure constituted stratified random selection, not random allocation to intervention and control groups.

Sample size was calculated at a significance level of 0.05 corresponding to a 95% confidence interval using the following formula:

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2}{d^2} n = \frac{(1.96 + 1.645)^2}{(0.66)^2} n_{final} = \lceil \frac{30}{1 - 0.10} \rceil = 34$$

$$n_{raw} = \frac{(1.96 + 1.645)^2}{(0.66)^2} = \frac{(3.605)^2}{0.4356} \approx 29.84 n_{raw} = 30 n_{final} = \frac{30}{(1 - 0.10)} = \frac{30}{0.90} \approx 33.33 n_{final} = 34$$

Educational Intervention

The intervention was developed after a literature review and consultation with discipline-specific and medical education faculty. [AUTHOR TO INSERT: the number, professional qualifications, relevant VTS training, and role of the facilitator(s), and whether intervention fidelity was assessed.] At an orientation session, the study purpose, educational procedures, and participation requirements were explained, questions were answered, written informed consent was obtained, and the pretest was administered. The 35 participants were organised into seven interdisciplinary teams of five students, with one student from each discipline in every team. The intervention was delivered face to face as three 90-min sessions on three consecutive days. All 35 participants attended the complete intervention and completed the post-test; therefore, intervention adherence was 100% at the participant level.

Day 1: The training session began with a 90 min guided group discussion, during which students looked at 10 artworks or paintings of older adults in different situations (active, working, alone, with family, alone, sick) to analyze faces and photos and guess the stories behind them using the VTS. Then, the

three key VTS questions were used to guide the discussion. What do you see in this picture? (Focus on careful observation and description without judgment), what in the picture makes you say this? (Emphasis on visual evidence). What else do you find? (Encouragement to discover hidden details during this discussion); students were encouraged to pay close attention to their communication and interaction patterns and to engage in the metacognitive process. After the VTS discussion, students were invited to reflect on the process and evaluate their performance. They were asked to consider questions such as “What did we do?”, “How did we work together as a group?”, “What did we observe?”, and “What did we particularly enjoy and find interesting about this process?” The discussion also emphasized the value of listening to different perspectives, the importance of active listening, and the benefits of refraining from making hasty judgments.

Day 2: After group reflection, the “Group Poetry” activity was introduced. Students in their groups were tasked with collaboratively creating a haiku poem based on a picture of an elderly person. Each group analyzed the picture of the elderly person and wrote a phrase they believed the face might be saying. The groups then worked together for the next 20 min to organize the lines into a haiku poem, which they subsequently performed for the class and participated in a group discussion.

Day 3, the “Mask Making” activity was introduced, in which students were presented with an artistic picture of an elderly person and asked to use a mask to express their feelings about it and paint their feelings on the mask. The session concluded with students describing their masks.

Outcomes

The two primary outcomes were (1) attitudes toward older people, expressed as the total KAOPS score, and (2) ageism, expressed as the total score on the Ahmadi et al. scale. Both outcomes were measured at baseline, immediately before the first workshop session, and at post-test, immediately after completion of the third session. The primary analysis metric was the within-participant change from pretest to post-test.

Research Instruments

The data collection instrument consisted of three main parts: Demographic information section included questions about age, gender, field of study, and previous courses related to aging. In the second part, attitude toward the elderly was measured using the Kogan's Attitudes toward Older People Scale (KAOPS). This instrument was designed by Kogan in 1961 to measure nurses' emotional attitudes toward the elderly. The original version includes 34 items in two 17-question subscales, "positive attitude" and "negative attitude". Responses are scored on a 6-point Likert scale (from strongly disagree = 1 to strongly agree = 6). Negative items are calculated in reverse order, and the total score range is 34 to 204. A higher score indicates a more positive attitude toward the elderly. The present study used the

Iranian version of KAOPS, whose psychometric properties have been examined by Raja et al. (2012). The reliability of the questionnaire was calculated with a Cronbach's alpha of 0.83 for the entire scale (14).

Ageism in Nursing Care of the Elderly Scale of Ahmadi et al. (2019) developed a valid and reliable instrument to assess ageism in nursing care in Iran. This 24-item scale assesses ageism in three domains: respect for the elderly in nursing care (14 items), consideration for the elderly and their basic care needs (5 items), and age discrimination and negative views of the elderly (5 items). Responses are scored on a four-point Likert scale, ranging from "strongly agree" (score 1) to "strongly disagree" (score 4). Items 21 to 24 are reverse coded. Total scores range from 24 to 96, with higher scores indicating higher levels of ageism and lower scores reflecting less ageism in providing care to the elderly. In the study by Ahmadi et al., the validity of this scale was obtained using a test-retest coefficient of 0.93 and an internal consistency (Cronbach's alpha) of 0.85 (15).

Because the intervention was an interactive educational workshop, participants and facilitators could not be blinded. To reduce assessment and analysis bias, post-test evaluators were unaware of participants' pretest scores, and the statistical analysis was performed by a researcher who had no role in data collection. Major concurrent events in the educational environment were recorded to assess possible history effects. Harms and unintended effects were not assessed using a formal instrument.

Data Analysis

Data were analysed using SPSS version 27. The distribution of outcome scores was examined using the Shapiro–Wilk test. Continuous variables are reported as mean and standard deviation, and categorical variables as frequency and percentage. The primary analyses compared pretest and post-test scores for each outcome using two-sided paired t tests with a significance level of 0.05. Effect sizes were reported where available. The analysis included all 35 participants with complete pretest and post-test data; no outcome data were missing. No interim, subgroup, or sensitivity analyses were performed.

Ethical Considerations

The study was conducted after approval by the Ethics Committee of Zahedan University of Medical Sciences (IR.ZAUMS.REC.1404.270). Written informed consent was obtained from all participants. Participation was voluntary, withdrawal was permitted without penalty, and participation did not affect academic grades or evaluations. Data were coded and analysed confidentially. The study was registered retrospectively in the Iranian Registry of Clinical Trials (IRCT) under [IRCT20190402043153N1] on [2026-07-30], after participant enrolment had commenced.

Results

Participant flow is shown in Fig. 1. Of 140 students assessed for eligibility, 30 did not meet the eligibility criteria and 110 were eligible. Of these, 35 were selected by simple random sampling and enrolled; the

remaining 75 eligible students were not selected. All 35 enrolled participants received the intervention, completed the pretest and post-test, and were included in the analysis. Recruitment, intervention delivery, and post-test follow-up occurred in fall 2025 .The study ended after the planned sample size was reached. The mean participant age was 23 years, and 17 participants (49%) were female (Table 1).

Table 1
Demographic characteristics of the participants

Variable	Category	Frequency (%)
Age	Under 22	3 (9)
	22 to 24	30(85)
	Over 24	2(6)
Gender	Female	17(49)
	Male	18(51)
Field of study	Medicine	7(20)
	Nursery	7(20)
	Physiotherapy	7(20)
	Diet	7(20)
	Sanitary	7(20)
	-	35(100)

For the ageism outcome, all 35 participants had data at both time points. The mean score decreased from 141.7 ± 0.9 at pretest to 120.4 ± 1.4 at post-test (paired t test, $p < 0.001$), indicating lower ageism scores after the intervention (Table 2).

Table 2
Mean and standard deviation of the stigma questionnaire

1	Item	Mean±Standard deviation after intervention	Mean±Standard deviation before intervention	Effect size	p-value
	Older people are more likely to die from chronic and degenerative diseases than from acute diseases.	**2.45 ± 1.10**	**3.50 ± 0.76**	**1.52**	**0.0**
2	Most seniors (age 65 and older) live in care facilities (nursing homes).	2.50 ± 1.24	3.35 ± 0.81	1.26	0.0
3	Strength, reaction time, and learning ability decline with age.	2.90 ± 1.17	3.80 ± 0.41	1.05	0.0001
4	About 80% of seniors can be active enough to do their normal tasks.	2.65 ± 1.14	3.55 ± 0.69	1.25	0.0
5	The majority of seniors are lonely.	2.80 ± 1.11	3.75 ± 0.55	1.15	0.0001
6	Most seniors, most of the time, feel very satisfied with their lives	2.70 ± 1.17	3.65 ± 0.49	1.15	0.0001
7	Intelligence generally declines with age.	2.50 ± 0.95	3.70 ± 0.47	1.72	0.0
8	Short-term memory (recently) declines with age.	2.40 ± 1.10	3.50 ± 0.76	1.53	0.0
9	Older people are more likely to be victims of crime than younger people.	2.70 ± 1.22	3.65 ± 0.67	1.15	0.0001
10	Older people tend to have rigid and inflexible beliefs.	2.20 ± 1.15	3.30 ± 0.86	1.53	0.0
11	Older people need more health care than younger people.	2.25 ± 0.91	3.40 ± 0.75	2.35	0.0
12	Most seniors live with their children.	2.95 ± 1.05	3.70 ± 0.57	1.04	0.0002
13	Many seniors are able to work and do hard work.	2.30 ± 1.03	3.50 ± 0.76	1.72	0.0
14	Most seniors are not involved in leisure	2.45 ± 1.05	3.55 ± 0.76	1.53	0.0

1	Item	Mean±Standard deviation after intervention	Mean±Standard deviation before intervention	Effect size	p-value
	Older people are more likely to die from chronic and degenerative diseases than from acute diseases.	**2.45 ± 1.10**	**3.50 ± 0.76**	**1.52**	**0.0**
	activities				
15	Most seniors do not need regular exercise to maintain their health	2.45 ± 1.28	3.35 ± 0.75	1.25	0.0
16	Most seniors are financially poor	2.90 ± 1.02	3.55 ± 0.69	1.32	0.0
17	Older people are inherently associated with mental disorders	2.00 ± 1.03	3.35 ± 0.81	2.01	0.0
18	Most seniors are retirees who have been forced to leave their jobs.	2.20 ± 1.01	3.30 ± 0.80	1.71	0.0
19	More than 12 percent of the U.S. population is 65 or older.	2.00 ± 0.97	3.35 ± 0.81	2.29	0.0
20	Most seniors are not sexually active.	2.70 ± 0.92	3.65 ± 0.75	1.86	0.0
21	Most older people are more religious than younger people.	2.50 ± 1.15	1.40 ± 0.60	1.39	0.0
22	Women, on average, live longer than men.	1.80 ± 1.01	1.20 ± 0.52	0.88	0.0009
23	Most older people are overly concerned about their health.	2.85 ± 1.23	1.85 ± 0.81	1.54	0.0
24	Most older people spend too much time watching TV.	2.10 ± 0.97	1.25 ± 0.55	1.14	0.0001

For the attitude outcome, all 35 participants had data at both time points. The mean KAOPS score increased from 103 ± 6.97 at pretest to 121 ± 6.12 at post-test (paired t test, $p < 0.001$), indicating more positive attitudes after the intervention (Table 3). No participants were lost to follow-up and no outcome data were missing.

Table 3
Mean and standard deviation of the Attitude Questionnaire

1	Item	Mean±Standard deviation before intervention	Mean±Standard deviation after intervention	Effect size	p-value
	The elderly should live in certain places.	**3.30 ± 0.55**	**2.78 ± 0.57**	**0.707**	**< 0.001**
2	The elderly should live with other segments of society.	3.48 ± 0.45	2.92 ± 0.51	0.721	< 0.001
3	The elderly are different from other segments of society.	3.90 ± 0.55	3.28 ± 0.53	0.996	< 0.001
4	The elderly are not particularly different from other segments of society.	3.73 ± 0.62	3.04 ± 0.58	0.774	< 0.001
5	The elderly accept the consequences of their work.	3.83 ± 0.56	3.20 ± 0.63	0.793	< 0.001
6	The elderly can adapt to new environments.	3.65 ± 0.81	3.13 ± 0.67	0.354	< 0.001
7	The elderly should not work when they retire.	3.47 ± 0.67	2.86 ± 0.69	0.470	< 0.001
8	The elderly prefer to work as much as they can.	3.57 ± 0.75	3.12 ± 0.53	0.299	< 0.001
9	The elderly usually live in old and outdated houses.	3.59 ± 0.72	2.93 ± 0.51	0.790	< 0.001
10	The elderly live in dignified and clean houses.	3.47 ± 0.45	2.93 ± 0.56	0.867	< 0.001
11	On their part, they cannot be more beneficial than they are detrimental to life.	3.52 ± 0.54	3.02 ± 0.56	0.784	< 0.001
12	The elderly behave respectfully and cautiously due to their age.	3.16 ± 0.45	2.66 ± 0.49	0.979	< 0.001
13	The elderly have a very great role and influence in society.	3.81 ± 0.52	3.26 ± 0.50	0.867	< 0.001
14	The elderly should have a lot of power in society.	3.37 ± 0.69	2.85 ± 0.62	0.270	< 0.001
15	The elderly easily make others feel bored.	3.92 ± 0.50	3.22 ± 0.68	0.635	< 0.001
16	Walking next to the elderly creates peace.	3.52 ± 0.52	3.03 ± 0.53	0.793	< 0.001

1	Item	Mean±Standard deviation before intervention	Mean±Standard deviation after intervention	Effect size	p-value
	The elderly should live in certain places.	**3.30 ± 0.55**	**2.78 ± 0.57**	**0.707**	**< 0.001**
17	The elderly endure life with reflection and requirements.	3.89 ± 0.61	3.34 ± 0.50	0.312	< 0.001
18	When the elderly learn from their mistakes, they leave them.	3.41 ± 0.66	2.85 ± 0.53	0.851	< 0.001
19	The elderly usually interfere and are curious in the affairs of others.	3.48 ± 0.54	2.93 ± 0.47	0.836	< 0.001
20	The elderly try to be more involved in their own lives.	3.63 ± 0.55	3.07 ± 0.53	0.936	< 0.001
21	The elderly usually make serious mistakes.	3.11 ± 0.66	2.60 ± 0.58	0.526	< 0.001
22	The elderly usually follow certain mistakes like young people.	3.69 ± 0.61	3.18 ± 0.54	0.340	< 0.001
23	The elderly usually have a negative impact on their peers.	3.82 ± 0.55	3.34 ± 0.65	0.520	< 0.001
24	When other segments of society associate with the elderly, they get positive effects from them.	3.68 ± 0.61	3.25 ± 0.56	0.433	< 0.001
25	The elderly are very similar to each other.	3.73 ± 0.59	3.17 ± 0.59	0.681	< 0.001
26	The elderly are no different from each other.	3.60 ± 0.61	2.97 ± 0.54	0.642	< 0.001
27	The elderly do not receive the necessary health care.	3.79 ± 0.78	3.28 ± 0.66	0.620	< 0.001
28	The elderly are no different from other segments of society in terms of health and adherence to its principles.	3.74 ± 0.55	3.24 ± 0.45	0.560	< 0.001
29	The elderly are usually grumpy, violent, and unsociable.	3.61 ± 0.53	3.09 ± 0.53	0.510	< 0.001
30	The elderly are cheerful, spirited, and cheerful.	3.51 ± 0.72	3.00 ± 0.46	0.715	< 0.001

1	Item	Mean±Standard deviation before intervention	Mean±Standard deviation after intervention	Effect size	p-value
	The elderly should live in certain places.	**3.30 ± 0.55**	**2.78 ± 0.57**	**0.707**	**< 0.001**
31	The elderly are indifferent to the current environment.	3.36 ± 0.51	2.92 ± 0.62	0.594	< 0.001
32	The elderly pay special attention to the young and their future.	3.39 ± 0.75	2.73 ± 0.62	0.545	< 0.001
33	The elderly demand more attention and affection than others.	3.85 ± 0.56	3.27 ± 0.51	0.797	< 0.001
34	The elderly are no different from other segments of society in terms of demanding attention and affection from others.	3.09 ± 0.59	2.60 ± 0.68	0.502	< 0.001

Harms and unintended effects

Harms were not systematically assessed; consequently, no formal harms analysis was performed.

Discussion

This study assessed pre–post changes in attitudes toward older people and ageism following a short VTS-based educational intervention. After the intervention, participants had higher attitude scores and lower ageism scores. These findings suggest that VTS may help students reflect on stereotyped beliefs and develop more balanced perceptions of older adults. However, because the study had no control group, the observed changes cannot be attributed solely to the intervention.

These findings are in line with studies that have shown that even a short educational session with a video about aging can reduce negative attitudes, and university courses such as “Human Growth across the Lifespan” with exercises about aging activities have been able to produce positive changes in students’ attitudes (16–18). These results are consistent with a systematic review by Burnes et al., which showed that educational interventions and intergenerational contact reduce negative attitudes (19). Also, a study by Miranzadeh et al. in Iran confirmed the effectiveness of structured education in reducing ageism (7).

In addition to the main results, more subtle changes were also observed; some students became more critical of positive or neutral stereotypes and revised their simplistic perceptions after the intervention. These findings are consistent with studies that have used artistic and visual methods to assess or change attitudes. For example, research has shown that the use of drawing tools can reveal implicit

ageism and show how people depict older people with signs of physical deterioration (20, 21). Intergenerational art programs have also reported that participation in creative activities can reduce ageism and social isolation. These findings are consistent with the results of Newsham et al. (22) and Nowacek and Lytle (23), who showed that art activities in university education challenge stereotypical attitudes. Similar to these studies, creative activities such as group poetry and mask-making in the present study also led a large proportion of students to have a deeper experience of interaction and empathy with the elderly. The findings are also consistent with the results of Keefe (10), who showed that many medical students had negative beliefs about aging before the intervention, but their attitudes changed after the training. This suggests that medical students are exposed to age stereotypes and that educational interventions can modify these attitudes. In addition, studies such as Hand et al. (11) have shown that intergenerational programs in higher education can create more positive attitudes toward the elderly. For example, an intergenerational videoconferencing project could increase the self-esteem of the elderly and reduce the negative attitudes of young people towards aging (12). Similar to these findings, the interdisciplinary composition of teams in the present study also enriched the learning environment and led a large portion of students to gain more diverse perspectives on the elderly.

The significant change in attitudes toward older adults is particularly important because ageism is prevalent in healthcare settings and can reduce the quality of care for older patients. Research has shown that negative stereotypes about aging can lead to adverse outcomes for patient health and satisfaction (13). Therefore, addressing these stereotypes early in medical education may play an important role in shaping students' future approaches to caring for older adults. The results indicate that students were more likely to engage with older adults in a more empathetic and respectful manner after the intervention, which could lead to more inclusive and equitable healthcare environments. Furthermore, changes in attitudes in areas such as family relationships, social participation, health, financial status, and lifestyle suggest that the intervention has been able to create a more comprehensive and positive view of aging, challenging the narrow view of aging as a period of decline.

To better understand how the intervention could change attitudes, it is necessary to look at its mechanisms. The VTS approach is based on active learning, critical thinking, and group discussion; elements that are particularly effective in fostering reflection (14). The examination of artworks and guided conversations allowed students to confront their assumptions about aging and consider alternative perspectives. This process can lead to cognitive conflict and force individuals to reconsider their beliefs. In addition, the participatory nature of VTS fostered a sense of community and shared understanding among students. Interaction and discussion with classmates provided an opportunity to challenge each other's assumptions and develop more diverse perspectives. This social learning is particularly important in medical education, as teamwork and effective communication skills are key competencies in this field. The findings of this study have important implications for medical education, particularly in preparing students to work with an increasingly elderly population. As demographics change and the elderly become more dependent on medical care, it is essential that educational programs incorporate strategies to counter ageism and foster positive attitudes toward aging. The VTS intervention is a suitable model for achieving this goal, as it not only reduces stereotypes, but also

strengthens communication skills and the ability to build effective relationships with elderly patients. Integrating VTS into medical education can also enhance students' cultural competence by encouraging them to consider the diverse experiences and perspectives of older adults from different backgrounds. This is particularly important in a context where ageism intersects with other forms of discrimination, such as racism and sexism, and can further marginalize older adults (15).

Several limitations should be considered. First, the single-arm pretest–posttest design lacked a concurrent control group; therefore, testing effects, maturation, regression to the mean, and other time-related influences cannot be excluded. Second, participants were selected from one university and the sample was small, limiting precision and generalisability. Third, outcomes were measured immediately after the intervention, so persistence of the observed changes is unknown. Fourth, participants and facilitators could not be blinded, and harms were not systematically assessed. Fifth, trial registration was retrospective.

Declarations

Ethical approval and consent to participate

The study was approved by the Ethics Committee of Zahedan University of Medical Sciences (approval code: IR.ZAUMS.REC.1404.270). Written informed consent was obtained from all participants before participation. All methods were conducted in accordance with relevant guidelines and regulations.

Trial registration

Iranian Registry of Clinical Trials (IRCT), [IRCT20190402043153N1], registered on [2026-07-30

]. The study was retrospectively registered after participant enrolment had commenced.

Protocol and statistical analysis plan

The ethics-approved study protocol and statistical analysis plan are available from the corresponding author on reasonable request.

Patient and public involvement

Patients and members of the public were not involved in the design, conduct, or reporting of this study.

Competing interests

The authors have no competing interests.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request, subject to ethics and confidentiality requirements.

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Authors' contributions
[N. Gh] made substantial contributions to the conception and design of the study. [F. G] was responsible for data collection. [A.A] performed the data analysis and interpretation. [T. A], [R. R] drafted the manuscript, and [.M k],[F.P] critically revised it for important intellectual content. All authors read and approved the final manuscript.

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References

1. Rahmani S, Pourhabib A, Alipour ZJ, Fotokian Z. Evaluating age-friendly emergency care quality in Iranian hospitals. BMC Emergency Medicine. 2026.
2. Organization WH. Ageing and health Available from: https://www. who. int/news-room/fact-sheets/detail/ageing-and-healt h2018. Accessed; 2021.
3. Piroozi B, Mohamadi-Bolbanabad A, Shokri A. The growth of aging population in iran: an achievement or a challenge? Journal of Gerontological Social Work. 2024;67(6):711-4.
4. Vahedi A, Andersson ÅG, Fure B. Medical students' attitudes towards older persons–a systematic review and meta-analysis. Medical Education Online. 2026;31(1):2661455.
5. Liu CC, Chen YJ, Fung XC, Pramukti I, Liu Ch, Liu LF, et al. Psychometric properties of instruments assessing ageism: A systematic review. International Journal of Older People Nursing. 2025;20(3):e70023.
6. Gianfredi V, Nucci D, Pennisi F, Maggi S, Veronese N, Soysal P. Aging, longevity, and healthy aging: the public health approach. Aging Clinical and Experimental Research. 2025;37(1):125.
7. Miranzadeh F, Sefidkar R, Rezaeipandari H. Effectiveness of an educational intervention in modifying ageism among nurses in caring for older adults: a randomized controlled trial. BMC nursing. 2025;24(1):1132.
8. Grosse A, Kokorelias K. Exploring ageism in medical education: A scoping review of the educational factors affecting the attitudes of medical students and junior doctors towards older inpatients. Australasian journal on ageing. 2025;44(1):e70016.
9. Morgan S, Pasco JC, Demers L, Young ME, Jindal SK. Combating ageism in medical education with narrative medicine. Gerontology & Geriatrics Education. 2025;46(1):5-16.
10. Rizi SM, Azizabadi Z. Comparing Knowledge and Attitudes Toward Elderly Care between Nursing Students and Clinical Instructors: A Cross-Sectional Study. International Journal of Caring Sciences. 2025;18(3):1550-7.

11. Ramaswamy R, Chow SW, Javier NM. Development and implementation of an anti-ageism curriculum for medical students. Gerontology & Geriatrics Education. 2025:1-11.
12. Agarwal G, Yenawine P, Manohar S, Chisolm MS. Implementing a Visual Thinking Strategies program in health professions schools: An AMEE Guide for health professions educators: AMEE Guide No. 179. Medical teacher. 2025;47(9):1425-34.
13. Son D, Kamimoto M, Inoue K, Taniguchi S-i. Cultivating Empathy through Visual Thinking Strategy Workshops for Medical Students and Residents: A Mixed-Methods Study. Yonago Acta Medica. 2026;69(1):139-44.
14. Hosseini SN, Asadollahi A, Moradi F, Ghahremani L, Javanmardifard S. The Effect of an Educational Program Based on Classical Persian Literature on the Quality of Elderly Care and Attitude toward Aging among Undergraduate Nursing Students: A Randomized Controlled Trial. Sadra Medical Journal. 2025;13(3):478-93.
15. Ahmadi P, Alavi NM, Gilasi HR, Safa A, Aghajani M. Developing a tool for evaluating ageism in nursing care of older people in Kashan/Iran. Journal of cross-cultural gerontology. 2019;34(1):25-33.
16. Doncel-Garcia B, Lizaso I, Fraile-Bermúdez AB, Mosquera-Lajas A, Santamaria-Trincado B, Sanz B, et al. Reducing negative aging stereotypes via educational intervention in older people: A randomized controlled study. Research on Aging. 2023;45(5-6):475-85.
17. Wurtele SK, Maruyama L. Changing students' stereotypes of older adults. Teaching of Psychology. 2013;40(1):59-61.
18. Pate M, Fugate-Whitlock E. ASSESSING STEREOTYPES OF OLDER ADULTS THROUGH DRAWING: IMPLICATIONS FOR PEDAGOGY IN UNDERGRADUATE AGING COURSES. Innovation in Aging. 2022;6(Suppl 1):661.
19. Burnes D, Sheppard C, Henderson Jr CR, Wassel M, Cope R, Barber C, et al. Interventions to reduce ageism against older adults: A systematic review and meta-analysis. American journal of public health. 2019;109(8):e1-e9.
20. Ivan L, Schiau I, Buzoianu C. The use of a drawing tool to assess the implicit ageism of students. Slovensky Narodopis. 2018(2):221-38.
21. Cook P. Confronting ageism through research: Translating research for the community. 2017.
22. Newsham T, Ramirez A, Fugate-Whitlock E, Crosby K. Development of Best Practices for Intergenerational Arts-Based Programs Addressing Ageism, Social Isolation, and Depression. International Journal of Education & the Arts. 2025;26(33).
23. Nowacek N, Lytle A. Using art and creative practice to provide education about ageism and age stereotypes. Educational Gerontology. 2023;49(11):961-5.
24. Keefe B. Attitudes toward aging: Educational interventions for medical students. Innovation in Aging. 2023;7(Suppl 1):805.
25. Hand MD, Kang H, Harvey K, Inoue M, Tompkins CJ, Ihara ES. Intergenerational learning strategies for addressing ageism among college and university students: A scoping review. Educational Gerontology. 2025;51(12):1283-310.

26. Carcavilla N, Meilán J, Llorente T, Martínez-Nicolás I, Tamayo-Mortera O. The impact of international videoconferencing among older adults and secondary students. Gerontology & Geriatrics Education. 2020;41(3):352-66.
27. Levy B. Stereotype embodiment: A psychosocial approach to aging. Current directions in psychological science. 2009;18(6):332-6.
28. Housen AC. Aesthetic thought, critical thinking and transfer. Arts and Learning Research. 2002;18(1):2001-2.
29. Ayalon L, Tesch-Römer C. Contemporary perspectives on ageism: Springer; 2018.

Figures

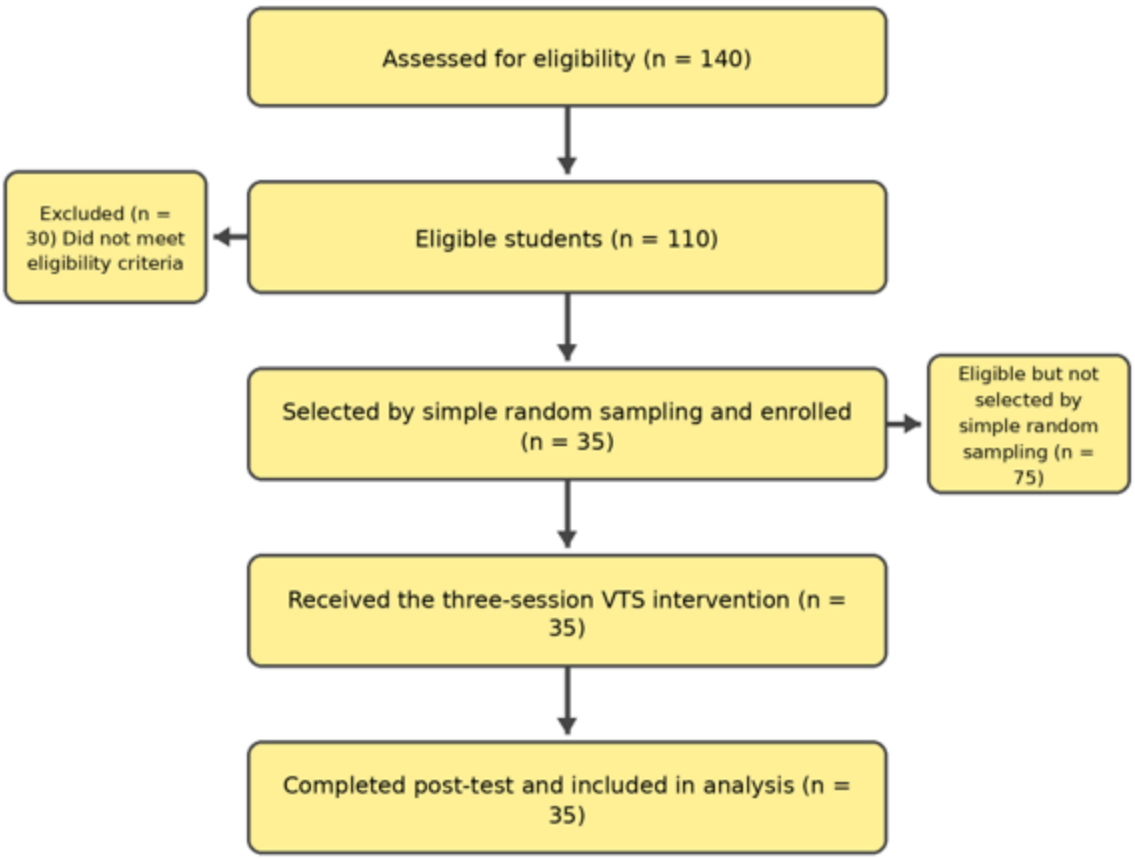


Figure 1

Participant flow through the single-arm study.