

Combatting ageism through virtual embodiment? Using explicit and implicit measures

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Abstract

Objectives: Ageism is defined as stereotypes, prejudice, and discrimination towards people because of their age. Although ageism can be directed towards people of any age group, most research has focused on ageism towards older people. Ageism towards older people is known to have a significant impact on their health and wellbeing and to even result in higher healthcare costs. The present study evaluated the use of virtual embodiment (VE) to reduce self- and other-directed ageism.

Design, setting, and participants: We randomized 80 individuals between the ages of 18 and 35 years to one of two conditions: VE as an older or a younger avatar.

Results: No differences were found on explicit measures of ageism. Once multiple comparisons were accounted for, a nonsignificant reduction in implicit age bias following exposure to the older avatar (Cohen's $d = .75$, $p = .02$) also was found.

Conclusions: Past research has established the effectiveness of VE in relation to implicit measures. However, once both explicit and implicit measures are included and multiple comparisons are accounted for, neither explicit nor implicit measures of ageism show a significant effect. Given the multidimensional nature of ageism, further research is needed to establish the effectiveness of VE once multiple measures of ageism are considered.

Key words ageism, discrimination, implicit, explicit, avatar, virtual embodiment, older adults

Introduction

Ageism is defined as stereotypes, prejudice, and discrimination towards people because of their age. Ageism can be reflected in a positive or a negative bias based on age and can be directed towards people of all age groups. However, most research to date has focused on negative aspects of ageism directed towards older people because of their age (Ayalon and Tesch-Römer, 2017). Another feature of ageism concerns the fact that it can be either explicit, well-acknowledged by those who hold it or implicit, performed with limited or no awareness or acknowledgement (Levy and Banaji, 2002). Moreover, in contrast to the other big “isms,” namely sexism and racism, ageism affects all of us and is considered “the enemy within” (Levy, 2001). People might hold ageist attitudes towards others, whom they perceive as different from them (e.g. an

out group), but they may also hold ageist views towards themselves given the often-negative value assigned to old age and internalized over the years. This demonstrates a distinction between other-directed and self-directed ageism as two aspects of ageism of relevance to the lives of older people (Ayalon and Tesch-Römer, 2017). Ageism is considered a major public health threat. It was identified by the World Health Organization (WHO) as a global threat to older people's health and wellbeing (World Health Organization, 2021). As such, ageism is now one of the four pillars addressed by the United Nation's Decade of Healthy Ageing with the understanding that ageism is a barrier to healthy aging and healthy longevity (World Health Organization, 2020).

Virtual embodiment as a strategy to reduce ageism

Following the WHO and the UN call to eradicate ageism, the present study evaluates a virtual embodiment (VE) method to reduce ageism. According to the self-perception theory, people form their

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opinions, feelings, and attitudes by observing their bodily sensations (Bem, 1972). This theory has been elaborated to account for exposure to the behaviors of an avatar (Bailey *et al.*, 2016). When the self-representation is modified in a substantial way compared with the physical self, the situation is called proteus effect. The person is thought to be inferring about his/her own internal beliefs and attitudes by observing one's behaviors in a virtual form (Fox *et al.*, 2013).

VE has been used as a tool to reduce ageism. A study conducted in Italy has found a reduction in implicit age bias after exposure to an old age virtual arm, unrelated to the position of the arm (La Rocca *et al.*, 2020). A different study conducted in the United Kingdom has exposed students to different conditions including VE. Based on qualitative interviews, the authors concluded that students acknowledged the importance of the simulation for contextualizing course materials relevant to old age and that identifying with the experiences of older people fostered frustration and distress among students (Hudson *et al.*, 2018). A different study has found that a VE task is comparable to embodied perspective taking, and both are insufficient to foster positive attitudes towards older people, when intergroup threat is direct and concrete, but when intergroup threat is abstract, VE is preferred to embodied perspective taking (Oh *et al.*, 2016). Experiencing an older avatar resulted in a slower walking pace compared with those who experienced a younger avatar and those in the control group. However, this effect lasted only for the first half of the walking phase (Reinhard *et al.*, 2020). Considering these mixed findings, clearly there is a need to further assess the utility of VE as a tool to reduce ageism.

Assessing the impact of a VE intervention on ageism

A recent review has concluded that currently, there are no psychometrically adequate measures to assess all dimensions of ageism (e.g. stereotypes, prejudice, and discrimination) (Ayalon *et al.*, 2019). Moreover, the fact that people might be reluctant to admit to being ageist makes the use of explicit measures questionable. Implicit measures, in contrast, are seen as superior because they can capture attitudes that people are unwilling to disclose or unaware of. The idea behind implicit measures is that performance indicators are inferred from behaviors such as response time or performance accuracy (Gawronski and Brannon, 2018).

According to the principles of a dual process theory, implicit biases are automatic and unconscious, and unaffected by respondent's motivation.

Explicit bias on the other hand represents a more conscious and deliberate processes (Forscher *et al.*, 2019). However, the evidence to support this assumption is equivocal. It has been argued that the predictive value of implicit measures is weak, and their incremental validity over self-report measures is small (Meissner *et al.*, 2019). Nevertheless, despite the limited correlation between implicit and explicit measures and the limited test–retest reliability of implicit measures at the individual level, at the aggregate regional-level implicit–explicit correlations and test–retest reliability are high (Hehman *et al.*, 2019). In addition, a different meta-analysis has concluded that attitudes, stereotypes, and identity measured either implicitly or explicitly are related to intergroup behaviors (Kurdi *et al.*, 2019).

Research concerning the impact of varied interventions on implicit measures is largely inconclusive. A recent systematic review has found that many interventions have no effect or even result in increased implicit bias, rather than reduced bias (FitzGerald *et al.*, 2019). A different meta-analysis had found weak short-term effects on implicit measures following brief single-session interventions. The authors also found that procedures changed explicit measures less and to a lesser degree compared with implicit measures. Changes in implicit measures did not account for changes in explicit measures, and changes in implicit bias did not result in comparable behavioral changes (Forscher *et al.*, 2019). Thus, further research is needed to better understand the unique contributions of implicit measures over and above explicit measures.

The present study

This study responded to a direct call put forth by the WHO and the UN to eradicate ageism because of its detrimental impact on the health and wellbeing of older people (World Health Organization, 2020, 2021). VE has shown promise in increasing empathy and reducing implicit negative attitudes in various domains (Banakou *et al.*, 2016; Hamilton-Giachritsis *et al.*, 2018; Li and Kyung Kim, 2021). In the case of ageism, results have been somewhat equivocal as VE as an older avatar also resulted in slower walking pace (Reinhard *et al.*, 2020) and greater frustration and distress (Hudson *et al.*, 2018). VE also was found ineffective in the face of a concrete explicit threat (Oh *et al.*, 2016). Moreover, to date, the entire spectrum of ageism, which addresses both others- and self-directed ageism and can be measured either explicitly or implicitly (Ayalon and Tesch-Römer, 2017), has not been adequately addressed in the context of VE interventions. As such, the study aimed to examine VE as a tool to reduce ageism towards older people.

We conducted a comprehensive assessment of ageism targeting both other- and self-directed ageism, relying on both explicit and implicit measures.

Methods

Procedure and sample

The study was approved by the Ethics Committee of the School of Social Work at Bar Ilan University (#061904/2). We recruited participants between the ages of 18 and 35 years from a university setting. Exclusion criteria were being pregnant, past negative experiences with virtual reality (VR), and history of epilepsy or seizures. All participants signed informed consent and received detailed explanations about the study prior to their participation. Participants were not reimbursed financially for their time. Recruitment took place within a public area of the university premises. Although most people who frequent the facility are students, we did not restrict the recruitment of study participants to university students. Hence, the sample represents the general public but consists mainly of university students. Recruitment occurred during two time periods: June 2021 and March–April 2022. A total of 80 participants were recruited. The average age of the sample was 23.4 ($SD = 5.83$; range = 18–33), 59% were men, and the average number of years of education was 13.81 ($SD = 1.70$; 11–20).

VE PROCEDURE

The VE was hosted on a DELL G5 5587 laptop with Oculus Rift and touch controllers, and the software was written by Sonarion LTD using Unity. The participant entered the VE environment (Figure 1) and was oriented to the contents of the room. Participants were instructed to look at "themselves" in the mirror and to move different body parts (e.g. to raise their arms). Participants were then asked to move different objects around the room. After that brief introduction, the participant was asked to step forward to the mirror in front of him/her and to look closely at "his/her" face, that is, the avatar face, and move his/her head from side to side while touching it with both hands, then step forward and backward a bit with his/her whole body and then use the hand-held touch device's thumb joystick to travel around the counter and push away objects to the floor. Lastly, the participant was asked to look again in the mirror and wave his/her hands. Participants were randomized to one of two conditions: VE of an older avatar (Figure 1) or VE of a younger avatar (Figure 2). Randomization relied on a pre-assigned random number list. The sex of the avatar was congruent with the sex of the respondent.

Measures

Except for the VE questionnaire which was completed while participants engaged in the VE tasks, all other measures were completed immediately after the VE task was completed.

VE QUESTIONNAIRE

This is a 12-item measure that assesses perception of embodiment as an indicator of the experiences of participants (Roth and Latoschik, 2019). The measure evaluates the ownership of the virtual body ("I felt like the virtual body was my body"), agency over the virtual body ("I felt like I was controlling the movement of the virtual body"), and changes in perceived body scheme ("I felt like the weight of my own body has changed"). These questions were ranked on a 1 (not at all) to 7 (completely agree) scale. A composite mean score was calculated. Cronbach's alpha was .79 in the present study. This questionnaire was administered to 41 participants who were enrolled in the VE task.

SELF-PERCEPTIONS OF AGING (SPA)

This eight-item measure represents self-directed ageism. The measure was developed based on five items from the Philadelphia Geriatric Center Morale Scale (Lawton, 1975) and three items from the Berlin Aging Study. Items range on a scale between 1 (not at all) and 6 (completely agree). A composite score was calculated to reflect overall ageism, composed of positive self-perceptions of aging (SPA) ("I am satisfied with the way I am aging") and negative SPA ("things keep getting worse as I get older"). Cronbach's alpha was .60 and .70, respectively.

SUCCESSION, IDENTITY, AND CONSUMPTION SCALE (SIC)

This measure represents other-directed ageism. The 20-item measure taps prescriptive beliefs concerning intergenerational conflicts related to the expectations surrounding older people's succession from envied positions/resources ($N = 7$ items; "It is unfair that older people get to vote on issues that will impact younger people much more"), the maintenance of an "old" identity, which does not cross over to the younger people's domain ($N = 5$ items; "Older people probably shouldn't use Facebook") and limited consumption/unfair depletion of shared resources ($N = 8$ items; "Older people don't really need to get the best seats on buses and trains") (North and Fiske, 2013). A higher score represents more negative ageist attitudes. In the present study, Cronbach's alpha was .88.



Figure 1. An image of an older avatar.

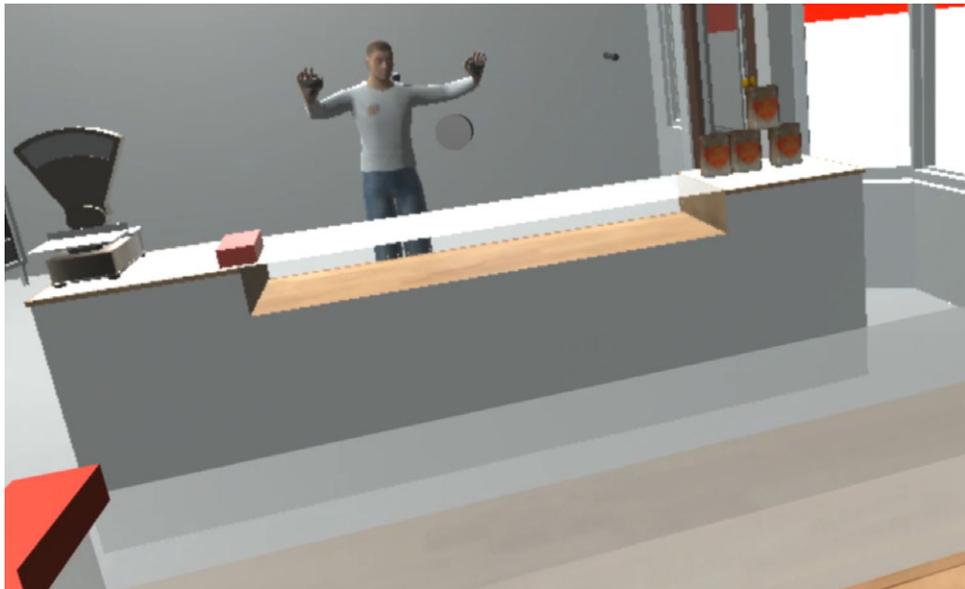


Figure 2. An image of a younger avatar.

BRIEF IMPLICIT ASSOCIATION TEST (BIAT)

The implicit association test is the most prominent measure of implicit attitudes. Response time is measured regarding congruently matched vs. non-congruently matched pictures of young/old faces and positive and negative words in terms of their valence (Hummert *et al.*, 2002). Compared with the IAT, the Brief Implicit Association Test (BIAT) has a fewer number of trials. However, it has shown to be psychometrically equivalent to the original IAT (Sriram and Greenwald, 2009). A higher score represents a more negative bias towards older people compared with younger people. This was administered

only during the second administration period and was completed by 41 participants.

Analysis

We first ran descriptive statistics to characterize the sample. Next, we examined between group differences (e.g. young vs. old VE) on VE questionnaire. To assess group differences on explicit outcome variables (e.g. SPA, SIC, and ERA), we conducted multivariate analysis of variance. Because the implicit measure (BIAT) was administered to only 41 participants, differences on this measure were assessed using *t*-test for independent samples.

Table 1. Differences in sample characteristics between the old vs. young VE tasks (N = 80)

	VE OLD (N = 39)	VE YOUNG (N = 41)	p
Age (18–35 years)	22.62(3.02)	23.18(3.34)	.48
Sex (woman)	45%	38.5%	.65
Education (11–20 years)	13.72(1.55)	13.90(1.86)	.78
VE questionnaire (1–7)	3.73(1.05)	3.81(.99)	.76
SPA-positive (1–6)	3.89(.91)	3.97(1.14)	.73
SPA-negative (1–6)	2.81(1.00)	2.70(1.16)	.66
SIC (1–6)	2.18(.16)	2.33(.78)	.36
BIAT (–.48 to 1.22)	.22(.32)	.48(.37)	.02

VE = virtual embodiment; SPA = self-perceptions of aging; SIC = Succession, Identity, and Consumption Scale; BIAT = Brief Implicit Association Test.

21 people participated in the VE old and 20 in the VE young for the completion of the BIAT measure.

Differences across the two conditions regarding demographic variables (e.g. age, gender, and education) also were examined.

Results

The VE experience suggested comparable moderate embodiment experiences in the two groups. Multivariate analysis of variance was nonsignificant (Hotteling’s test), indicating that there was no significant differences on the explicit measures of ageism (e.g. SPA, SIC). Independent samples *t*-test was conducted to assess the implicit measure (BIAT), which was administered to 41 participants. This measure did not meet the Bonferroni correction cutoff (.01). Respondents exposed to an older avatar showed a reduced negative bias towards older people compared with those exposed to a young avatar, which matched their sex. This intervention resulted in a large effect size of .75 but was nonsignificant once multiple comparisons were considered and the cutoff for statistical significance was adjusted for. As noted, the explicit ageism scales did not show a difference between the two experimental conditions. There also were no differences across the two conditions in the VE experiences reported by participants nor in any of the demographic variables examined (see Table 1).

Discussion

The present study was inspired by the recent call put forth by the WHO and the UN to address ageism given its detrimental impact on older people’s health and wellbeing (World Health Organization, 2020, 2021). The study also was guided by the understanding that the assessment of ageism should be multimodal and incorporate both implicit and explicit measures (Ayalon *et al.*, 2019). Given

equivocal findings concerning the role of VE in addressing ageism and the varied impact of different interventions on implicit vs. explicit measures, both types of measures were included. Moreover, because ageism can be directed both towards others as well as towards one-self (Ayalon and Tesch-Römer, 2017), we examined the possible impact of the VE task on both forms of ageism. This approach is innovative as past research has looked only at implicit measures in the context of VE.

Our findings suggest that if only a single implicit measure were used, young people who are virtually embodied via an older avatar’s image would have been less likely to show a negative bias towards older people. However, although the effect size of the VE task on the implicit measure was moderate to large, it was nonsignificant once multiple comparisons were considered. This finding should be viewed considering past VE research which had failed to report findings concerning explicit measures. The present study, in contrast, examined both implicit and explicit outcomes and found no differences between respondents who experienced VE with a young vs. an older avatar once multiple comparisons were considered. In contrast to the implicit measure, which would have been significant had it been used as a single outcome measure, there were no differences on the explicit measures of ageism, which captured both self- and other-directed ageism, regardless of the number of comparisons.

To date, VE interventions that have shown effectiveness in reducing negative attitudes towards out groups have relied on implicit measures (Banakou *et al.*, 2016; La Rocca *et al.*, 2020). Our study adds by highlighting the fact that none of the explicit measures showed a significant effect. Moreover, once both implicit and explicit measures are taken into account, the effects of the VE task become nonsignificant even for the implicit measure, which had a moderate to large effect size.

Conclusions and limitations

The VE experiment used in this study was quite simple. It required participants to perform varied tasks, such as taking items off the counter or lifting their hands following the instructions of the person administering the study. Supposedly, the only difference experienced by participants assigned to one of the two groups was the age of the avatar staring back at them in the mirror and representing their own reflection. Future research will benefit from a more detailed elaboration of differences between avatars. For instance, pace and steadiness of movement could differ between the two avatars, with the older avatar being slower or even more shaky than the younger avatar. Moreover, a task which includes other people and their reactions to the avatar could also be informative and perhaps even educate participants about exposure to ageism. For instance, the older avatar might experience people trying to help him or her cross the street or lift the groceries without even asking or might experience social exclusion and social invisibility as a means to educate participants about the negative experiences of many older people (Scharf *et al.*, 2005). In reflecting on the experiment, it also is important to note that although the two avatars are supposed to differ only based on their age, it is possible that the older avatar was deemed less physically attractive compared with the younger avatar. This difference, however, reflects differences in attitudes towards younger and older people's attractiveness in general (He *et al.*, 2021).

Another limitation of the study concerns using a randomized procedure, which relied on a single time point to measure the immediate effects of the intervention. In addition, as already noted, there is no clear consensus concerning the best way to measure ageism (Ayalon *et al.*, 2019). Moreover, the value of implicit measures is still questionable (Meissner *et al.*, 2019). As such, the present findings should be reviewed within an emerging field, which is still looking for an answer concerning the best ways to capture undesirable, multidimensional constructs, such as ageism. Our findings question the value of VE as a possible way to reduce ageism towards older people, once multiple outcomes are taken into account. As ageism is a major threat to the health and wellbeing of older people worldwide, it is our duty to continue and identify future interventions that may reduce ageism as well as measures that capture changes brought by such interventions. Our findings point to the questionable beneficial effects of VE on implicit age bias towards older people, once explicit measures of ageism also are considered. Further research is needed to explore the long-term effects of this intervention as well as to

better understand the multidimensional nature of ageism as captured by the different measures in the context of a VE intervention.

Acknowledgements

We wish to thank Dr. Assaf Suberry for his tremendous assistance with the implementation and analysis of the implicit measure.

This work was supported by a grant from the Impact Center for the Study of Ageism and Old Age provided by Gabi Weisfeld.

Conflicts of interest

None.

Source of funding

Impact Center for the Study of Ageism and Old Age.

Description of authors' roles

LA: concept development, analysis, and write-up.
ED: concept development and intervention design.
SF: concept development and critical revisions.

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