



Age integration in later life social networks and self-perceptions of aging: examining their reciprocal associations

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Abstract

Relying on the age segregation theory (limited contact between age groups), this study examined the temporal reciprocal associations between age integration—the inclusion of older and younger people in one’s personal network—and one’s self-perceptions of aging (SPA). Data came from the 2014 and 2017 waves of the German Ageing Survey and focused on adults aged 60 and above ($N = 5239$). Age composition of the network was assessed as the number of kin and non-kin in the social network who are either more than 10 years older or more than 10 years younger than the respondent. A latent change score model assessed the bidirectional associations. The results showed that adults who had younger social network members, both kin and non-kin, had better SPA 3 years later. A positive SPA at baseline also predicted a higher number of younger non-kin and older non-kin relationships over time. These results stress the role of SPA in adults’ social network as well as the role of age integration in shaping adults’ SPA. Practitioners and policy makers should encourage connections between people of different ages and should strive to decrease the age segregation in society.

Keywords Self-ageism · Social networks · Age integration · Longitudinal

Introduction

Age segregation is considered both a cause and a consequence of negative views of older adults and ageism in modern western society (Hagestad and Uhlenberg 2005). Factors such as retirement age in the workplace, the age-based organization of education, geographic segregation and role division by age produce barriers for sustained contact and meaningful connection across cohorts (Riley and Riley 2000). This spatial, institutional, and cultural segregation ultimately leads to an underrepresentation of age-diverse peers in the personal networks of contemporary adults.

Gerontologists have long pointed to the potential downsides of limited contact between different age groups. Age-segregated networks may limit understanding of others’ experiences, reinforce age-based prejudices, and remove opportunities for learning skills and perspectives from those younger or older than themselves (Burnes et al. 2019; Butler 1969; Hagestad and Uhlenberg 2005; Uhlenberg 2000). To date, however, the literature has by and large overlooked age integration—the inclusion of older and younger people in one’s personal network—as a means to improve the perspectives of older adults towards their own aging process. Age-integrated networks could reduce the salience of perceived age-based in- and out-group distinctions and make older adults less susceptible to negative aging perceptions. Such self-perceptions of older adults, in turn, are crucial to consider because of their importance for health in old age (Bellingtier and Neupert 2016; Levy et al. 2002a, b; Levy 2003).

At the same time, optimistic views of aging may predispose older adults to maximize the age inclusivity of their personal networks. Rejecting negative perceptions about aging—that it is inexorably linked to loneliness, fatigue and incompetence—could prompt older individuals to engage in

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activities that foster relationships between age groups and reduce perceived age-based barriers in their social lives.

With both possibilities in view, the present study examines the bi-directional effects of self-perceptions of aging (SPA) and age integration in personal social networks of older adults. Drawing from the common ingroup identity model and stereotype embodiment theory, we use longitudinal data from the German Ageing Survey to disentangle the temporal directionality of networks and self-perceptions. Tracing these associations over time can shed light on the role of social relationships in the aging process and offer insight on the notion that age segregation is both cause and consequence of self-directed ageism.

Does network age integration shape self-perceptions of aging?

The division of young and old people is perpetuated through multiple macro-level structures (Hagestad and Uhlenberg 2005), but also expressed straightforwardly in people's close personal networks. From the perspective of older adults, the progressive loss of work-, family-, and community-based roles leads to less contact with people of different ages and often results in an age-segregated inner social circle. In particular, older adults seldom cite young, non-kin others as member of their personal social networks. For example, a recent study of older European adults found that less than 10 percent of older Europeans identify a non-kin confidant from younger cohorts (10 years or more apart) in their core social network (Sun and Schafer 2019).

The lack of interaction between the old and the young is considered to be a main cause of negative views of older adults (Ory et al. 2003; Weiss et al. 2013). However, research is lacking on the effects of age segregation and integration on aging perceptions directed at the self (Marques et al. 2020). This is an important gap, as older adults themselves often internalize ageist perceptions of old age which then manifest in their self-perceptions of aging (SPA) (Levy 2009). These SPA reflect the way older adults view their aging process and they have implications for physical health, mental health and mortality in old age (Bellintier and Neupert 2016; Levy et al. 2002a, b; Levy 2003).

We expect that older adults with more age integrated social networks may perceive themselves and their aging process move positively. According to the common ingroup identity model, positive contact—including the companionship, emotional aid, and informational support frequently exchanged among confidants—predisposes people to view the ingroup and outgroup as a single common group (Gaertner et al. 2000) and to consequently hold positive perceptions of the ingroup. Consistent with this idea, an experimental study showed that older adults who reported positive contact with different age groups (e.g.,

recent pleasant interactions with young people, frequency of contact with grandchildren) were least vulnerable to negative aging stereotypes when completing a cognitive ability test (Abrams et al. 2006). The authors interpret this as protection against stereotype threat, that is the internalization of negative stereotype imposed on one's group. Another study found that older people who interacted with university students as part of an intergenerational service-learning program improved in well-being and lowered their stereotyped perception of themselves (Hernandez and Gonzalez 2008). While informative, neither of these previous studies uses a representative sample. And, perhaps more importantly, neither study accounted for the possibility that self-perceptions also—or instead—shape one's exposure to age-diverse social contacts.

Does SPA shape network age integration?

Though reasonably conceptualized as an outcome of age segregation, SPA can also encourage actions that are in line with one's perceptions of aging adults (Wurm et al. 2013), representing a type of "self-fulfilling prophecy." Stereotype embodiment theory proposes that over the life course, people are exposed to myriad negative stereotypes about old age. These stereotypes are internalized, and as people grow older, they come to embody these stereotypes (Levy 2009). Thus, for instance, older adults in England who believed aging to be a time of loneliness were found to feel lonelier eight years later (Pikhartova et al. 2016). On the other hand, more positive perceptions of aging can counteract late-life disengagement and promote continued social connectedness. A recent longitudinal study, for instance, demonstrates that older adults with positive SPA report more friends (Menkin et al. 2017). Another longitudinal study using data from the German Ageing Survey (as was incorporated in the current investigation), found that more positive SPA was related to higher involvement in formal and informal social settings (Schwartz et al. 2021).

It is yet unknown whether SPA is associated with the age integration of older adults. Older adults are commonly stereotyped as being helpless and irrelevant (Ory et al. 2003). Thus, negative views of one's aging might lead to a fulfillment of such stereotypes by foregoing opportunities to meet and socialize with younger people, while holding a more positive view might predispose older adults to seek and spend time with younger people. Providing some support for this premise, a recent qualitative study found that older Irish adults who saw themselves as defying negative stereotypes of old age acted in accordance with their more positive self-perception by seeking out friendships with younger people and expressing an interest in new social norms and technologies (O'Dare et al. 2019).

Kin and non-kin ties

When considering the age integration of older adults with younger people, analyses should differentiate between kin and non-kin ties. Families are one of a few remaining age-integrated social institutions, providing a context in which people of different ages continually meet and interact (Hagestad and Uhlenberg 2006). Indeed, Sun and Schafer (2019) found age integration to be higher when kin relationships were considered, compared to considering only non-kin ties. However, families are bound together by normative obligation and family relationships could also be ambivalent and in some cases even conflictual (Fingerman et al. 2004). Thus, age integration through kin-based relationships might be less strongly associated with SPA compared to non-kin social ties, which are more voluntary and more strongly linked to various dimensions of well-being, as was found in a study based on the German Ageing Survey (Huxhold et al. 2013).

Upward integration

Most research on age integration focuses on the connections of younger people with older adults but overlooks cases where older adults are connected to people still older than themselves, termed "upward integration" (Sun and Schafer 2019). However, older people display ageist attitudes towards other adults who are older and in worse health than themselves (Kotter-Grühn and Hess 2012). Older adults could also benefit from having contacts with people older than themselves; for example, learning from older peers and observing benign or positive aspects of aging could reduce negative perceptions and expectations of their own aging self. Related to the reverse causal direction, adults who feel better about their aging might more readily engage in social contact with people who are older (Martens et al. 2004).

The present study

Despite the established social and personal benefits of contact between age groups (Hagestad and Uhlenberg 2005), little is known about how age integration in people's social networks is associated with perceptions of their own aging. The current study will examine the reciprocal associations between the age composition of adults' social networks and SPA. It will consider both kin and non-kin ties, as well as upward and downward age integration. These reciprocal links will be examined over time, allowing for a disentangling of the temporal associations between the study concepts. The study will be guided by two hypotheses:

1. The age composition of the social networks will have bi-directional associations with SPA over time. Thus, more age integrated networks (networks characterized

by younger and/or older members) will be related to better SPA over time, and a more positive SPA at baseline will be related to a more age integrated network over time.

2. These associations will be stronger for non-kin network members than for kin connections.

Method

Sample

Data were taken from the German Ageing Survey (DEAS), a national, representative, longitudinal survey of the German community dwelling population aged 40–85 years old (Klaus et al. 2017). The present study focused on older adults aged 60 and above. It uses data collected in 2014 and 2017. Participants were interviewed personally by interviewers using a Computer Assisted Personal Interview (CAPI). In addition, respondents were given a paper–pencil questionnaire to fill out ("drop-off"). Seventy eight percent of the total sample in 2014 filled in the paper–pencil questionnaire which contained the variables regarding SPA ($N=5239$). Selectivity analysis showed that completers had more social network members, were younger, had higher education and better physical and mental health. Of these, 3206 respondents participated again in 2017 and completed the paper–pencil questionnaire. As in other studies, attrition analyses suggested that follow-up participants had better SPA, had more older kin ties, more kin ties of the same age, more non-kin ties of the same age, were on average younger, better educated, healthier (physically and mentally) and more frequently participating in sports and cultural events than the baseline sample. Effect sizes of the differences between participants who dropped out of the study and those who remained in the study did not exceed $d=0.3$, indicating a relatively weak selectivity effect. Full information maximum likelihood (FIML) procedure was used to deal with attrition (Acock 2005). This approach uses all available data, regardless of whether a person stayed in the sample over time or not.

Measures

Self-perceptions of aging

We used the "Attitudes toward Own Aging" subscale from the Philadelphia Geriatric Center Morale Scale to assess SPA (Liang and Bollen 1985; McCulloch 1991). The subscale appeared in the drop-off of the waves of data collected in 2014 and 2017. This subscale consists of five items: (1) "The older I get, the worse everything becomes", (2) "I Have same energy as last year", (3) "The older I get, the

less useful I am”, (4) “The older I get, life is better than expected”, and (5) “I am now as happy as in younger years”. The response options for each item ranged from 1 “Strongly agree” to 4 “Strongly disagree”. Negatively phrased items were reverse coded, such that higher SPA scores were related to better SPA. The scale has good reliability in the present sample (Cronbach’s alpha at baseline: 0.74; follow-up: 0.75).

Age integration

Respondents were asked to name up to eight people who are important to them and with whom they maintain regular contact. They were then asked to provide additional information on these social network members, including their role relationships (e.g., partner, child, friend) and their age. We thus created four variables measuring the age integration of participants’ social network. Younger or older kin and non-kin network members were defined as being aged ten or more years apart from the age of the respondent, following the definition in Sun and Schafer (2019). The existing literature uses varied criteria for age integration. For example, Uhlenberg and Jong (2004) defined “younger network member” as 5 or more years younger than the respondent. We chose the 10-year definition to more clearly delineate the age differences between the individual and his or her network members. Each variable was a count of the number of social network members who are either younger or older, kin or non-kin: younger kin members, younger non-kin members, older kin members and older non-kin members.

Covariates

The multivariate analyses controlled for age, gender, education, place of residence, subjective health, number of illnesses, depressive symptoms, same age ties and involvement in sports and cultural events, due to their possible associations with self-perceptions of aging and age integration (Levy et al. 2002a; Wolff et al. 2018; Sun and Schafer 2019). Age, gender, and place of residence (East vs. West Germany) were used as covariates since as the DEAS sample is stratified by these variables. Age was entered as a continuous variable when it was used as a covariate. Place of residence was assessed as East Germany and West Germany. Education was based on the international standard classification of education (ISCED; UNESCO 1997). It was divided into two categories: the first category was low and middle education, and the second category was high education.

Subjective health was indicated by a single item of self-rated health (“How would you rate your present state of health?”) with answers ranging from 1 (*very bad*) to 5 (*very good*). Physical health was assessed using a summary of answers to a checklist of 11 illnesses, such as diabetes and cardiovascular diseases (range 0–11), such that a higher

score represents worse health. Similar questionnaires that assess diseases have been validated against medical records (Katz et al. 1996). Depressive symptoms were measured with the short form of the German translation of the CES-D (Center for Epidemiologic Studies Depression) Scale. The scale contains 15 items assessing depressive symptoms, and its value is the sum of the 15 items that must all be available. High values indicate higher depressive symptoms. The scale had good reliability in the present study (Cronbach’s alpha: 0.86).

We also controlled for kin and non-kin social network ties who are in a similar age as the respondent, to account for the possibility that the social network measures reflect respondents who have overall larger social networks. For that purpose, we created two variables—the first was a count of the number of kin who are less than ten years older or younger than the respondent and the second was a count of the non-kin ties who are less than ten years older or younger than the respondent. We additionally controlled for the frequency of engagement in sports activities and cultural activities, to account for respondents who have an overall more active lifestyle. Each variable ranged from 1 “Daily” to 6 “Never”. They were recoded so that higher values indicate more frequent engagement in the activities.

Data analysis

The analysis began with univariate descriptive statistics and Pearson correlations for the variables in the study. Next, we utilized a structural equations model to examine the main study questions, using a Latent Change Score (LCS) approach. LCS models are a powerful and flexible class of structural equation modeling that explicitly model change as a latent variable (McArdle 2009). Latent change scores are created by setting the regression path between baseline and follow-up equal to 1, implying that some portion of the follow-up score is equal to the baseline score, and the residual variable is interpreted as a change score (McArdle and Nesselroade 2014).

SPA was modelled as a latent variable to account for measurement error and it was composed of the five scale items described above. The error terms of the negatively phrased items were allowed to covary, as were the error terms of the positively phrased items, and the first path loading was set to 1. The age integration variables were four indicators based on count scores of SN members who were younger and non-kin, younger and kin, older and non-kin, older and kin. Because these were count variables, they were estimated with Poisson models. The main data analysis was performed MPLUS (version 8.3; Muthén and Muthén 2017). Full model fit information is not available for models with Poisson variables in MPLUS and therefore cannot be used to determine model fit. Thus, chi-square difference tests based

on loglikelihood values were conducted to compare the fit of competing model specifications (Satorra and Bentler 2010). Missing data were handled by full information maximum

likelihood available in Mplus. The models testing the study hypotheses included covariates controlling for the variables of interest at both measurements. All models additionally controlled for baseline gender, age, education, place of residence, subjective health, number of illnesses, depressive symptoms, social network members of a similar age, sport and cultural activities. Error terms were allowed to covary among matching factor loadings at the two time points.

Table 1 Descriptive analyses of the study variables

Variable	M%	SD	Range
SPA T1	2.92	0.56	1–4
SPA T2	2.92	0.55	1–4
Younger kin T1	1.76	1.38	0–7
Older kin T1	0.14	0.43	0–5
Younger non-kin T1	0.36	0.80	0–7
Older non-kin T1	0.06	0.28	0–4
Younger kin T2	1.74	1.42	0–8
Older kin T2	0.11	0.38	0–4
Younger non-kin T2	0.37	0.82	0–6
Older non-kin T2	0.05	0.24	0–3
Age	71.24	7.19	60–95
Gender (women)	47.9%		
Residence (East Germany)	33.7%		
Education (high)	40.9%		
Number of illnesses	2.97	1.92	0–11
Subjective health	3.44	0.81	1–5
Depressive symptoms	6.45	5.68	0–41
Same age kin T1	1.07	0.95	0–7
Same age non-kin T1	0.93	1.30	0–8
Sports activities	3.26	1.83	1–6
Cultural events	1.97	0.75	1–6

SPA self-perceptions of aging, *N* = 5239, data source: German Ageing Survey (DEAS)

Results

Table 1 shows descriptive information on the study variables. Respondents were on average aged 71 years, less than half were women, a third lived in East Germany and over forty percent had high education. They reported a mean of 3 illnesses while rating their health as "average". Their networks, on average, had 1.8 people who were younger kin, and less than one person who were older kin, younger non-kin and older non-kin. Additionally, they reported having about one network member who was at a similar age to them and kin, and one person who was at a same age to them and non-kin.

We present the correlations among the main study variables in Table 2. Having higher SPA at both measurements was related to having more older kin network members and younger non-kin members. Having better SPA as T1 was related to having more older non-kin members as T2.

Table 2 Pearson correlations of the main study variables

	SPA T2	Younger kin T1	Older kin T1	Younger non-kin T1	Older non-kin T1	Younger kin T2	Older kin T2	Younger non-kin T2	Older non-kin T2
SPA T1	0.64***	0.01	0.07***	0.01	0.02	0.03	0.04*	0.03*	0.05**
SPA T2	–	0.03	0.06***	0.04*	–0.01	0.03	0.07***	0.05**	0.03
Younger kin T1		–	0.02	–0.11***	–0.07***	0.44***	0.00	–0.10***	–0.04*
Older kin T1			–	–0.05***	0.04**	–0.01	0.51***	–0.02	0.05**
Younger non-kin T1				–	0.05***	–0.06***	0.00	0.36***	0.00
Older non-kin T1					–	–0.03*	0.05**	0.01	0.31***
Younger kin T2						–	0.03*	–0.14***	–0.05**
Older kin T2							–	–0.04*	0.03
Younger non-kin T2								–	0.03
Older non-kin T2									–

p* < 0.05, *p* < 0.01, ****p* < 0.001; SPA self-perceptions of aging, *N* = 5239, data source: German Ageing Survey (DEAS)

Testing bi-directional associations between age integration and SPA

Table 3 presents the parameter estimates for the full bi-directional model. The model indicates that higher baseline SPA was related to having more younger non-kin members and older non-kin members in one's social network over time. Having younger kin members as well as younger non-kin members were both associated with improvements in SPA over 3 years, when controlling for socio-demographic and health covariates. Figure 1 shows a graphical presentation of the model.

We performed a series of analyses to test for differences according to the age and kinship status of network members. Because an association was seen between both younger kin and younger non-kin ties to change in SPA, we examined which direction of association was stronger. For that purpose, we imposed equality constraints on the directional regression paths and compared their fit to a non-constrained model. The constraints led to deterioration in model fit, as seen in a chi-square difference test ($\chi^2(1)=4.99, p < 0.05$), indicating statistical difference between the two paths. Younger non-kin ties had a larger association with change in SPA in comparison to younger kin members. Because younger ties were significantly associated with change in SPA, we wanted to examine whether their associations differed from those of older ties with SPA. We imposed equality constraints on the associations of the four age integration variables with change in SPA, and this led to a deterioration in model fit ($\Delta\chi^2(3)=7.30, p < 0.01$). Taken together, these

results indicate that overall younger ties, both kin and non-kin, are related to positive SPA. However, non-kin young ties are particularly meaningful for the SPA of adults, in accordance with the second hypothesis.

We additionally compared the temporal associations between SPA and subsequent younger and older non-kin ties. Equality constraints on the examined regression paths did not produce a deterioration in model fit ($\Delta\chi^2(1)=0.28, p > 0.05$), indicating no statistical difference between the two paths. Thus, the associations of SPA with having more younger non-kin members did not differ from the association of SPA with having more older non-kin members. The finding of significant links between SPA and non-kin ties, both younger and older, suggests a stronger association of SPA with non-kin ties compared to kin ties, in accordance with the second hypothesis.

Discussion

The current study set out to examine the reciprocal associations between SPA and the age integration of social networks in old age. It adds to the literature by looking at age integration in relation to self-perceptions of older adults themselves. The study found partial support for the existence of a reciprocal association, in accordance with the first hypothesis. That is, baseline SPA was related to more age integration, and baseline age integration—extended to younger network members—was related to improved SPA. The second hypothesis was partly confirmed, as positive

Table 3 Parameter estimates for the full latent change score model

	SPA Δ B (SE)	Younger kin T2 B (SE)	Older kin T2 B (SE)	Younger non-kin T2 B (SE)	Older non-kin T2 B (SE)
SPA T1	-0.14 (0.01)***	-0.04 (0.06)	0.05 (0.29)	1.21 (0.36)**	1.48 (0.41)***
Younger kin T1	0.01 (0.01)*	-0.24 (0.01)***	0.01 (0.04)	-0.10 (0.03)***	-0.10 (0.07)
Older kin T1	0.01 (0.02)	-0.01 (0.03)	1.07 (0.07)***	0.05 (0.09)	0.12 (0.15)
Younger non-kin T1	0.04 (0.01)***	-0.03 (0.02)	0.05 (0.09)	0.47 (0.03)***	-0.04 (0.11)
Older non-kin T1	-0.03 (0.03)	-0.01 (0.05)	0.12 (0.17)	0.01 (0.12)	1.06 (0.09)***
Age	-0.01 (0.00)***	0.01 (0.01)	-0.12 (0.01)***	0.03 (0.00)***	-0.08 (0.01)***
Gender (women)	-0.01 (0.02)	0.03 (0.03)	0.01 (0.12)	-0.11 (0.08)	0.44 (0.19)*
Residence (East Germany)	-0.01 (0.02)	-0.15 (0.03)***	-0.35 (0.13)*	-0.41 (0.09)***	-0.02 (0.01)
Education (high)	0.03 (0.02)	0.03 (0.03)	-0.07 (0.13)	0.12 (0.08)	-0.37 (0.18)*
Number of illnesses	-0.01 (0.01)	0.01 (0.01)	-0.01 (0.04)	0.02 (0.03)	0.07 (0.05)
Subjective health	0.01 (0.02)	0.02 (0.02)	-0.05 (0.08)	-0.28 (0.08)**	-0.38 (0.14)**
Depressive symptoms	0.01 (0.01)	-0.01 (0.01)	0.01 (0.02)	0.04 (0.01)**	0.05 (0.02)*
Same age kin T1	0.01 (0.01)	0.01 (0.01)	0.05 (0.06)	-0.10 (0.04)*	-0.12 (0.11)
Same age non-kin T1	0.01 (0.01)	0.01 (0.01)	0.05 (0.04)	0.05 (0.03)	-0.08 (0.06)
Sports activities	0.00 (0.00)	-0.01 (0.01)	0.05 (0.04)	0.01 (0.02)	-0.01 (0.01)
Cultural events	0.01 (0.01)	0.03 (0.02)	0.01 (0.09)	-0.08 (0.02)	0.03 (0.03)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; SPA self-perceptions of aging, $N = 5239$, data source: German Ageing Survey (DEAS)

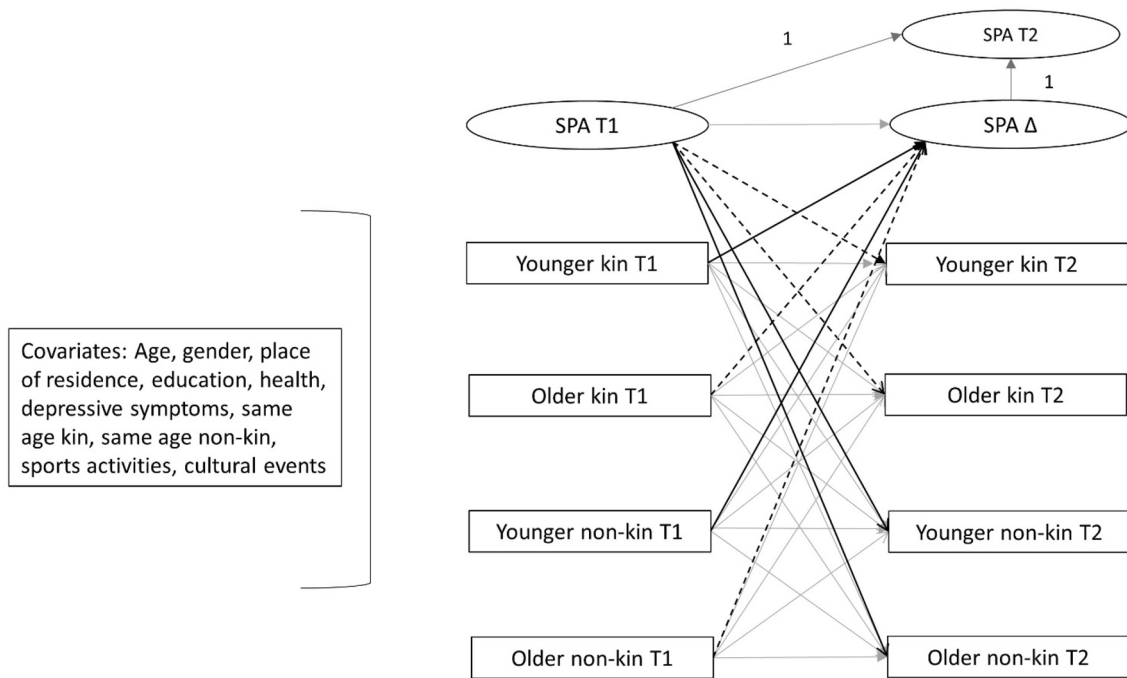


Fig. 1 Graphical representation of the model used in the study. SPA self-perceptions of aging; Observed variables are drawn as squares and unobserved (latent) variables are drawn as circles; black paths are

the main paths of interest; significant paths are bold and non-significant paths are dashed

SPA at baseline was related to more non-kin social network members (both younger and older) over time.

The current study sheds light on the association of older adults' social environment with the way older adults view themselves. Adults reporting more younger individuals in their close network also perceived their aging as more positive over time. Maintaining close ties with younger individuals could serve as a sign that adults are aging more positively and defying the negative stereotypes of old age. In accordance with the common ingroup identity model, more positive contact may have encouraged these adults to view their ingroup and the outgroup of younger adults as a single common group (Gaertner et al. 2000). Theoretically, this could have led to them forming a more positive perception of their ingroup and ultimately of the aging process itself. The association was identified for both kin and non-kin network members, even though we hypothesized that non-kin ties would be mainly associated with positive SPA. This suggests that the common ingroup identity model could also apply to kin, as children, grandchildren, nieces and nephews could be viewed as belonging to an outgroup of "younger people" and contact with them could be interpreted as making older and younger people part of a single common group.

The findings indicate that not only was age integration related to improved SPA, but the reverse direction was also relevant. While the effects of SPA are well established in relation to health and well-being in older age, less is known

about their social implications, particularly in relation to age integration of social networks. Our findings indicate that those who view their aging as more positive are also more likely to have more age integrated networks over time. They might have internalized more positive perspectives on aging (Levy 2009), which manifest in more age integration. The effects of SPA were found, however, mostly in relation to non-kin network members. Adults with more non-kin ties from different age groups could disregard the stereotypes of old people as irrelevant (Pikhartova et al. 2016) and strive toward involvement with a diverse array of individuals. A potential implication of having more age diverse networks, especially if they are not family members, is the exposure of older adults to more varied social stimuli and resources and the promotion of a more active lifestyle (Sun and Schafer 2019). Such activities could lead to better health outcomes, a possibility that should be examined in future research.

The association of SPA with upward age integration draws attention to this less explored aspect of age integration. While older adults are often viewed as the targets of ageism from younger people, older adults can also be ageist towards those older than themselves. These very old people could face a heightened risk of social isolation (Wrzus et al. 2013). Our findings indicate that improving adults' SPA could result in potentially reducing some of this increased risk also among old-old adults by better integrating them with younger age groups. We note that SPA predicted the

changing representation of older non-kin network members, but there was no evidence for an association in the opposite hypothesized direction. This can indicate that aging perceptions are a stronger driver of contact with older others, while such contact in itself might not be enough to become internalized into one's aging perceptions.

Overall, our findings could be viewed in light of the claim that the lack of interaction between the old and the young is considered to be "the root of ageism" (Hagestad and Uhlenberg 2005). As aging adults lose roles that placed them in contact with people of different ages, other members of society can come to view them more negatively by creating "us versus them" distinctions (Hagestad and Uhlenberg 2005). Indeed, a recent review found contact between different age groups to be highly effective in reducing people's ageist attitudes towards older adults (Burnes et al. 2019). To date, however, much of the literature has examined age integration as a means to reduce ageism directed towards the *other group* (younger persons towards older adults and vice versa), overlooking the perspectives of older adults towards *their own aging process* (Marques et al. 2020). Thus, this study could indicate that the separation of young and old might not only be the root of ageism among young people (Hagestad and Uhlenberg 2005), but also of ageism by older adults towards themselves.

Our study has several strengths, including a large sample, a longitudinal design and a cross-lagged analysis. Nevertheless, we note some limitations. The measure of the social networks asks respondents to name up to eight individuals that are of importance and that the respondent has regular contact with, thus disregarding weaker ties. While close ties are meaningful to the health and well-being of older adults (Cornwell and Laumann 2015), weaker ties are also beneficial (Huxhold et al. 2020) and their inclusion could have affected the outcome of the study. Future studies would benefit from a more comprehensive assessment of age integration in people's networks. Such an examination of weaker ties could also allow to explore more social relationships with those who are over ten years older or younger compared to the participants. Further, despite the strengths of the latent change score approach, longitudinal model estimates should not be taken as evidence of causal relationships. Omitted variables could confound the cross-lagged associations, and so all hypothesis tests based on correlational data should be approached with caution. We also note that this study was performed with a German sample, and this could limit the generalisability of the analyses for other countries. For example, countries from various European regions could differ in the structure of later-life social networks and the meaning ascribed to them (Cohn-Schwartz et al. 2021). Thus, future studies should examine these results in a larger European and global context. Finally, some of our social network outcomes had a preponderance of zeros and therefore

could be potentially modelled using zero-inflated Poisson approach. However, our attempt to specify these models using zero-inflated Poisson functions failed to converge, leading us to adopt a Poisson model for the count variables. We note that future studies to determine whether our findings can be replicated with less skewed measures.

To summarize, the current study highlighted the reciprocal temporal links between age integration and SPA at old age. Adults who had more age integrated social networks also improved their SPA over time, while adults with a more positive SPA had more age integrated networks, particularly with non-kin ties. Our findings suggest that practitioners working with the older population should encourage connections between people of different ages and policy makers should strive to increase the age integration in society. For example, they could encourage more programs that facilitate contacts between different age groups, such as those for adult learners in college or communal gardens in which neighbourhood members of all ages can meet. Furthermore, practitioners should aim to improve the aging perception of older adults, as it can enhance their social integration.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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