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Do older adults construct more emotionally gratifying social environments than younger adults? Evidence from a social network decision task

Jonathan J. Rolison[1] · **Veronica M. Lamarche**[1]

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Abstract
Do older adults construct more emotionally gratifying social environments than younger adults? According to socioemotional selectivity theory (SST), older adults actively construct their social environments to satisfy emotional goals, drawing closer to gratifying close others and pruning less rewarding persons. Yet, there is a scarcity of direct evidence showing that older adults indeed construct more gratifying social environments by pruning negative persons and by drawing closer to positive persons. We employed a novel social network decision task to study age-related differences in the emotional composition of social environments that people construct and associations with emotional experience. In three studies, participants spanning the adult age range constructed hypothetical social environments, choosing among players according to their performance on word search puzzles and valenced feedback provided by the players about the participants' own performance. Positive valence players always provided positive feedback, whereas negative valence players always provided negative feedback. Our findings partially support SST but draw a theoretically important distinction between pruning existing social environments and constructing new social environments. When pruning an existing social environment, older adults maintained more positive as well as more negative valence players. Conversely, when required to include players to construct their social environment, older adults produced more positive social environments by excluding negative valence players. The social environment participants constructed was associated with their emotional experience, but our findings suggest that emotion drives gratifying social choices rather than vice versa. Implications for lifespan theory of motivation are discussed.

Keywords Socioemotional selectivity theory · Social networks · Emotion processing · Positivity

Introduction

With advancing age comes improvements in emotional well-being, reflected by markedly less negative emotion and stable or increased positive emotion (Mroczek & Kolarz, 1998). The social contexts in which people live provide an important source of positive and negative emotional experience (Fischer et al., 2003). According to socioemotional selectivity theory (SST; Carstensen, 2006), people shape their social environments to serve emotional goals. It follows that with advancing age people draw closer to emotionally gratifying close family members and prune less emotionally rewarding persons from their social environment to improve their emotional well-being (English & Carstensen, 2014). Yet, family members and other close relationships can be a source of negative emotion and conflict (Ogolsky & Gray, 2016), and thus, fail to serve emotional goals. Older adults may also prioritize close relationships for reasons other than emotional gratification (Agnew & Le, 2015; Joel et al., 2018), which could motivate them to keep these close others around despite them not fulfilling emotional goals. Currently, there is a dearth of direct evidence to demonstrate that older adults actively construct emotionally gratifying social environments by pruning emotionally negative persons and by drawing closer to emotionally positive persons. To this end, we introduce a novel social network decision task to study age-related differences in the emotional composition of social environments that people construct and subsequent influences on emotional experience.

✉ Jonathan J. Rolison
jrolison@essex.ac.uk

[1] Department of Psychology, University of Essex, Wivenhoe Park, Colchester, UK

According to SST (Carstensen, 1995, 2006; Carstensen et al., 1999), goal pursuit in adulthood is driven by perceptions of one's time horizon. In young adulthood, time is perceived as unlimited, which prioritizes future-oriented information acquisition goals that are preparatory for the future. Large social networks with diverse members (e.g., romantic partners, friends, new acquaintances) and varied social experiences afford access to novel encounters and learning opportunities that satisfy information acquisition goals (Charles & Carstensen, 2010). As age advances, one's time remaining is perceived to shorten, which instead prioritizes emotion regulation goals and a focus on close social ties (e.g., family members) that offer more positive emotional experiences (Charles & Carstensen, 2010). Thus, an important tenet of SST posits that older adults actively construct their social environments to satisfy emotional gratification goals (Carstensen et al., 1997).

Consistent with SST, as age advances, the size and diversity of people's social networks decrease, owing primarily to decline in the number of non-familial personal and friendship network members (Lang, 2000; Lang et al., 1998; Wrzus et al., 2013). Conversely, the number of family members in people's social networks is more stable with age. Older adults also report more positive emotion and less negative emotion in association with members of their social networks than do younger adults (English & Carstensen, 2014). And, independent of age, negative emotion associated with a person's social network is associated with more negative emotional experiences in their daily lives (English & Carstensen, 2014). Yet, rather than contain more emotionally gratifying members, older adults may instead possess biased perceptions of members in their social network. Older participants have been found to perceive their marital partners' behaviors more positively whilst discussing marital conflict than objective raters of their partner's behavior (Story et al., 2007). Older adults also report less negative emotional responses than younger and middle-age adults when describing a recent event in which they were upset by a member of their social network (Birditt & Fingerman, 2003). Idealization of one's romantic partner can even have self-fulfilling effects on relationship satisfaction and well-being, cushioning against conflict and doubt (Murray et al., 1996). These findings indicate a positivity bias in older adults' appraisals of close others in their social network. Therefore, rather than constructing emotionally gratifying social environments, older adults may instead possess biased perceptions of their social environment, viewing their close relationships through rose tinted glasses.

Given that older adults have biased perceptions of their existing social network, laboratory-based behavioral tasks may provide a fruitful method for studying age-related differences in how people engineer their social environment in a controlled setting. Fredrickson and Carstensen used a card sorting task to study age-related differences in how people conceptualize social relationships (1990; see also Carstensen & Fredrickson, 1998). Participants were asked to arrange potential social partners (e.g., a sibling, a sales representative) into groups according to how similar it would feel to spend time with them. Older adults discriminated social partners more according to the anticipated emotional affect of a social interaction than did younger adults. Younger adults instead discriminated social partners more according to future relationship prospects. In another task (Fung et al., 1999), participants were asked whether hypothetically they would prefer to spend time with a familiar person ('a member of your immediate family') or an unfamiliar person (e.g., 'the author of a book you have just read'). Older adults were more likely than their younger counterparts to choose the familiar person (Fung et al., 1999). However, as discussed above, older adults may possess biased emotional evaluations of familiar others, rather than actively seek positive emotional experiences offered by familiar relationships. Older adults may also prioritize familiar relationships over new social encounters or more peripheral social partners for reasons other than emotional gratification, such as for social support offered by close relationships (Cohen & Wills, 1985; Feeney & Collins, 2015; Guiaux et al., 2007; Kahn & Antonucci, 1980; Uchino, 2009).

In the present research, we used a novel social network decision task to study age-related differences in the emotional composition of social environments people construct. To overcome limitations of previous research, rather than probe participants' existing social networks, we presented participants hypothetical social partners about which, they had no prior knowledge. On each of a number of rounds, participants and ten other 'players' earned points based on their performance on a word search puzzle. Participants could add or remove players from their team (i.e., social network) based on the points players earned on the puzzle and written feedback provided after each round by each other player about the participant's own performance on the puzzle. To study emotional influences on participants' choices to include or exclude players, the players were designed such that some always provided positive feedback (e.g., 'excellent', 'good attempt') and others always provided negative feedback (e.g., 'atrocious', 'disappointing'). Thus, in constructing their social environment, participants could either prioritize player performance by including on their team players who earned the most points or prioritize emotional gratification by including positive players and removing negative players.

Laboratory environments in which participants interact with other 'players' have been used widely in social psychology to study social behavior. For example, the Cyber-Ball task was developed to study effects of social ostracism on a sense of belonging (Williams et al., 2000;

Williams & Jarvis, 2006). In this task, participants play a virtual ball-tossing game with two computer-generated players who initially include the participant in the game (i.e., tossing them the ball) and later exclude them from the game. Ostracism induced by ostensible rejection by the interaction partner(s) increases negative emotion as well as decreasing a sense of control and belonging, even when administered remotely via the Internet (Williams et al., 2000; Williams & Jarvis, 2006). Presently, we employ our social network decision task to examine whether the emotional composition of the social environment that participants construct—in terms of the proportion of positive players included on their team—has subsequent effects on emotional experience. If, according to SST, older adults construct emotionally gratifying social environments to promote positive emotional experiences, then we should find beneficial effects of older adults' social choices on their subsequent emotions.

In three studies we investigated age-related differences in participants' social choices on the social network decision task and subsequent effects on emotional experience. In Studies 1 and 2, all other players were initially included on participants' team. Following each round, participants could remove (i.e., prune) players from their team or add previously removed players to their team. This method mimics the socioemotional processes by which people prune social members from their existing social environment. In Study 3, participants instead began the task with none of the other players initially on their team, requiring participants to include players to construct their team. This latter method enabled us to test whether constructing one's social environment as opposed to pruning one's social environment elicits the same socioemotional processes with age. Although previous studies have focussed on how adults prune their existing social environments, older adults must also construct new social environments. For instance, an older adult who moves to a residential home or accepts care support at home, must select among social partners (e.g., new residents, carers) in a new or partially new social environment. As discussed earlier, age-related differences in the composition of people's social networks are dictated by various factors, including emotional goals and social support offered by close relationships. Our social network decision task is not designed to mimic the complex interpersonal processes involved in real social networks. Other players with whom participants interact during the task are not designed to imitate family members, friends, and other acquaintances in people's real social network. Rather, our aim is to investigate whether, in a controlled environment, older adults construct more emotionally gratifying social environments than younger adults, which is purported by SST to be a primary driver of adult age changes in social network composition in the service of emotional goals.

In terms of emotional goals, our studies draw a theoretical distinction between *situation modification* (Studies 1 & 2) and *situation selection* (Study 3). Situation modification refers to modifying one's social environment (e.g., pruning social partners), whereas situation selection refers to changing one's social environment by choosing to enter or avoid social encounters (e.g., including new social partners; Gross, 1998). Situation modification and selection are examples of proactive emotion regulation strategies that shape one's socioemotional environment, as opposed to later emotion regulation strategies such as reappraisal or attention allocation (Charles, 2010; Urry & Gross, 2010). Age-related differences in the use of proactive strategies may be larger than for later processing strategies (e.g., reappraisal) to the extent that proactive strategies are potentially less cognitively demanding (Charles, 2010; Urry & Gross, 2010).

In one of few studies to have empirically tested the distinction between situation selection and modification (Livingstone & Isaacowitz, 2015), younger and older adults could either choose whether to view (situation selection), or could elect to skip (situation modification), emotionally valenced material. In both conditions, older adults spent less time than younger adults viewing negative material, implying greater deployment of both proactive strategies among older adults. Yet, while both strategies are proactive, situation selection specifically requires the ability to predict one's future emotional experiences in particular situations (Urry & Gross, 2010). Regarding situation selection, this ability is necessary for deciding whether to approach or avoid situations (or people) based on the emotions that one is likely to experience (Urry & Gross, 2010). Older adults are better than younger adults at predicting their emotional arousal (Nielsen et al., 2008). Thus, older adults may use situation selection as a means of curating partners in their social environment, rather than situation modification, afforded by their ability to predict accurately their future emotional experiences.

Based on the theoretical propositions of SST, our overarching hypothesis was that older adults would construct more emotionally gratifying social environments than younger adults, containing a greater number of positive players and fewer negative players. However, distinguishing proactive emotion regulation strategies, age-related differences in the emotional composition of participants' social environments may be larger in the situation selection context (Study 3) than in the situation modification context (Studies 1 & 2). Finally, we explored whether constructing more emotionally gratifying social environments has positive subsequent effects on emotional experience. In the extant literature, there is limited evidence of a connection between age-related positivity effects and emotional outcomes (Isaacowitz & Blanchard-Fields, 2012). In a previous study, older adults oriented their attention toward positively

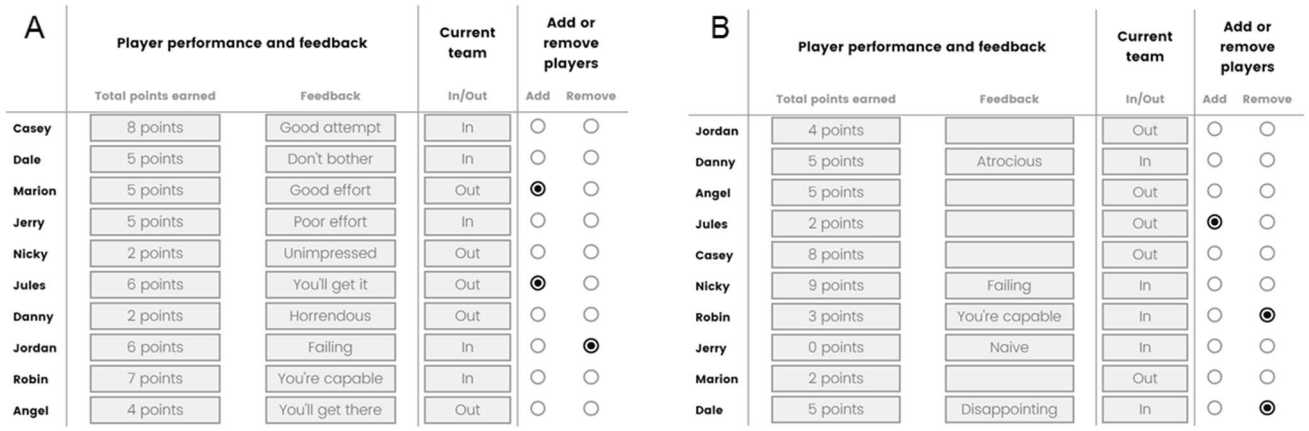

Fig. 1 Example display of the social network task in Study 1 (**A**) and Study 2 (**B**)

valenced faces and away from negatively valenced faces following negative mood induction, and subsequently reported improvements in their mood (Isaacowitz et al., 2008; see also Isaacowitz et al., 2009). Younger adults' gaze preferences were instead congruent with their induced mood, orienting their attention toward negatively valenced faces following negative mood induction. As such, older adults appear to orient their attention toward valenced stimuli in service of mood-regulatory goals. To our knowledge, no previous study has tested whether age-related differences in social choices are associated with mood regulation in real time. This is because previous research has examined associations between a person's mood and the composition of their existing social networks (English & Carstensen, 2014).

Study 1

Methods

Participants

Two hundred forty US residents were recruited via Amazon Mechanical Turk. The quality and reliability of data provided by the Amazon Mechanical Turk platform is comparable with face-to-face and behavioral testing methods and provides a socioeconomically diverse sample (Casler et al., 2013; Gibson et al., 2011). As a data quality control, participants were asked to provide their date of birth at the beginning of the study and their age in years at the end of the study. This was done in order to exclude participants who provided inconsistent responses, and thus, unreliable data regarding their age. Participants ($n = 33$; 14%) were excluded if they failed to provide a date of birth that was within two years of their reported age in years. Our final sample included two hundred seven participants (54% male; age range = 22–84; mean age = 54.19, $SD = 16.90$) across four age bands (18-40$_{years}$, $n = 58$; 41-60$_{years}$, $n = 54$; 61-70$_{years}$, $n = 54$; +70 $_{years}$, $n = 41$), ensuring representation in younger, middle, and older age ranges. Our sample size and age distribution were determined based on previous studies of adult age differences in social choices and were similar to those of previous studies (e.g., Carstensen, & Fredrickson, 1990, 1998). No participants were recruited after initial data analysis. Regarding employment, the majority of younger to middle-age adults (≤60 years; $n = 96$, 89%) were in full-time employment, whereas close to half of older adults (> 60 years; $n = 46$, 45%) were retired. Regarding education, a similar number of younger to middle-age and older adults indicated high school ($n = 18$, 17%; $n = 12$, 12%, respectively), some college ($n = 35$, 32%; $n = 27$, 28%, respectively), or a university degree ($n = 43$, 39%; $n = 39$, 40%, respectively) as their highest education attainment. Ethical approval for the study protocol was provided by the internal ethics review board. All participants provided electronic informed consent before participating in the study.

Materials and procedure

Social network decision task On each of five rounds, participants had 20 s to find a word (e.g., lamp) related to a topic area (e.g., bedroom items) in a word search puzzle that comprised a 14 × 14 cell matrix. Participants earned points for their team according to how quickly they found a word (≤ 5 s = 5 points, ≤ 10 s = 4 points, ≤ 14 s = 3 points, ≤ 17 s = 2 points, ≤ 20 s = 1 point) if they found a word in the puzzle. Participants were given a practice attempt to familiarize them with the word search puzzle. After each puzzle on each round, participants were told how many points they earned and how many points were earned by ten other players who also completed the puzzle (Fig. 1A).

On each round, participants also received feedback from each of the other players about their performance on the puzzle (Fig. 1A). Five 'positive' valence players were randomly assigned to always provide positive feedback and five 'negative' valence players were randomly assigned to always provide negative feedback ('atrocious', 'disappointing'). The points earned by each player were randomly determined (from a Gaussian distribution) on each round to minimize any association between points earned and feedback valence. Regarding positive players, if the participant earned points on the puzzle they received confirmatory feedback (e.g., 'excellent', 'doing well'), and if they failed to earn points, they received supportive feedback (e.g., 'you'll get it', 'good attempt'). Positive feedback was tailored in this way to player performance to avoid the feedback appearing condescending. The feedback provided by negative players was not contingent on participants' performance.

All ten players were initially on the participants' team. On the first round, participants could remove players from their team by clicking an option box corresponding to the player(s) they wished to remove. Participants could remove as many players as they wished on each round. On later rounds, participants could remove additional players or bring players back onto their team by clicking corresponding 'add' or 'remove' option boxes (Fig. 1A). On each round, a 'current team' column displayed which players were currently on the participant's team according to which players had been added or removed on previous rounds. Participants' scores were accumulated with the scores of other players on their team. Adding players to one's team raised the group score whereas removing players from one's team reduced the group score.

Following all five rounds, participants were asked to rate the valence of the ten players on a 7-point scale, ranging 'very negative' (value of -3), 'neutral' (value of 0), to 'very positive' (value of 3). Participants were shown the display of the final round to remind them of the players.

Emotional experience Participants rated to what extent they were feeling each of 18 emotions in the present moment on a 7-point scale, ranging 'not at all' (value of 1) to 'extremely' (value of 7). The list comprised 8 positive emotions (e.g., 'happiness', 'joy') and 10 negative emotions (e.g., 'anger', 'sadness') used previously to assess emotional experience (e.g., English & Carstensen, 2014). Participants rated a randomly determined subset containing half the positive and negative items before the social network task and rated the remaining items following the social network decision task. Hence, participants were pseudo-randomly assigned a subset of the emotion items each time they rated their emotional experience, ensuring that they did not rate the same emotion twice.

In all studies, we report all measures, manipulations and exclusions.

Results

Word search puzzle performance

On average, participants correctly identified 2.15 ($SD = 1.41$) words in total across the five rounds, earning a mean of 5.73 ($SD = 4.78$) points. Linear regression analyses indicated that advancing age was associated with identifying fewer correct words ($b = -0.00$, $t = 2.07$, $p = .039$) and earning fewer points overall ($b = -0.04$, $t = 7.12$, $p < .001$).[1]

Player valence ratings

Following all five rounds of the social network task, participants rated the valence of the ten other players. A linear regression analysis, including player valence (positive, negative) and participant age (mean centred), confirmed that participants rated positive valence players ($M = 1.61$, $SD = 0.96$) as significantly more positive than negative valence players ($M = -1.43$, $SD = 1.65$; $b = 3.04$, $t = 22.88$, $p < .001$). There was no significant association with age ($b = -0.01$, $t = 1.46$, $p = .145$). In a second block, there was no significant age × player valence interaction. One-sample t-tests confirmed that mean valence ratings for positive ($t(206) = 24.08$, $p < .001$) and negative ($t(206) = -12.42$, $p < .001$) valence players differed significantly from zero.

Social network choices

We conducted a multilevel logistic regression analysis (in R version 3.5.1) on participants' team choices following all five rounds. The binary dependent variable represented whether (value of 1) or not (value of 0) each player was maintained on the participant's team. Fixed effects were included for participant age (as continuous), as well as a quadratic term for age, player valence (positive, negative), and total points earned by each player. We included quadratic effects for age as people's real life social networks have been shown to display quadratic age trends, increasing in size from younger to middle-age and then decreasing in size into older age (English & Carstensen, 2014; Wrzus et al., 2013). Continuous predictors were mean centred. Random intercepts were included for participant to account for

[1] Participants' performance on the puzzle (number of correct words or total points) was not associated with their social network choices and our results for social network choices were not altered by additionally controlling for participants' performance on the puzzle.

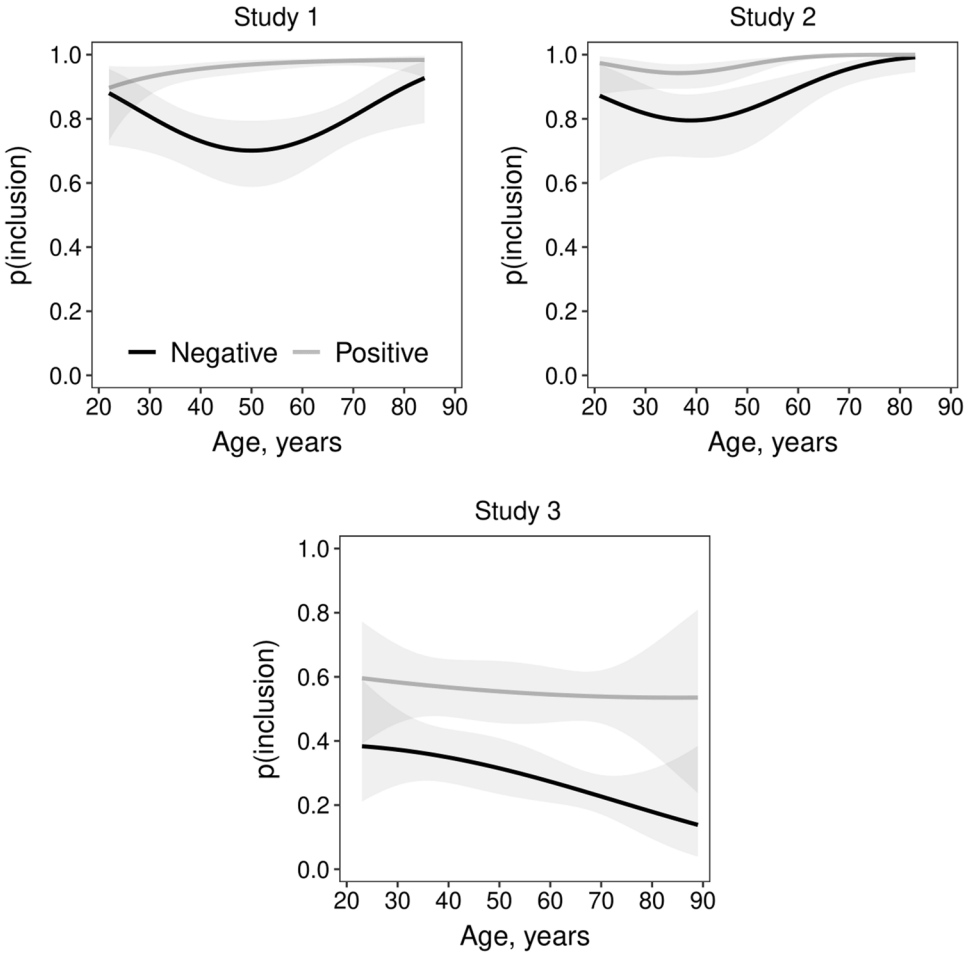

Fig. 2 Association between participant age and probability of including positive and negative feedback players in the social network task. Shaded areas indicate the 95% confidence intervals. The y-axis indicates the probability that players were included on participants' team

repeated measurements within participants. The analysis revealed that participants were significantly more likely to maintain on their team players who provided positive feedback (probability player maintained [$p_{maintain}$] = 0.96) than players who provided negative feedback ($p_{maintain}$ = 0.74; $b = 2.10$, $t = 12.97$, $p < .001$). Participants were also more likely to maintain on their team players who scored a higher number of points ($p_{maintain}$ = 0.94 vs. $p_{maintain}$ = 0.79, 1 *SD* above and below mean; $b = 0.19$, $t = 9.10$, $p < .001$). There was no significant linear ($b = 11.14$, $t = 1.62$, $p = .105$) or quadratic ($b = 9.37$, $t = 1.38$, $p = .169$) association with participant age. The absence of an overall association with age indicates no age-related differences in the total number of players included on participants' team.

Next, we included interaction terms involving linear and quadratic effects of participant age and player valence and total points earned. This revealed a significant interaction between the linear ($b = 21.39$, $t = 3.03$, $p = .002$) and quadratic (b = -20.04, $t = 2.94$, $p = .003$) effects of age and player valence. A sensitivity power analysis using 100 simulations with an alpha significance criterion of 0.05 and an estimated effect size of $d = 0.50$ (Astivia et al., 2019), indicated an estimated power of 98% to detect the quadratic age × player valence interaction. There were no significant interactions between the linear (b = -0.55, $t = 0.59$, $p = .555$) or quadratic (b = -0.89, $t = 0.97$, $p = .334$) effects of age and player points. Figure 2 displays the quadratic age × valence feedback interaction. With advancing age, participants were more likely to keep players on their team who provided positive feedback (b_{linear} = 23.17, $t = 2.60$, $p = .009$; $b_{quadratic}$ = -5.20, $t = 0.59$, $p = .556$; Fig. 2). Conversely, as age advanced from younger (22 years, $p_{maintain}$ = 0.88) to middle age (lowest point, 50 years, $p_{maintain}$ = 0.70), participants included fewer players on their team who provided negative feedback, but thereon included more negative feedback players as age advanced into older age (84 years, $p_{maintain}$ = 0.93; Fig. 2). The quadratic ($b_{quadratic}$ = 13.88, $t = 1.89$, $p = .059$), but not the linear effect of

age (b_{linear} = 3.37, t = 0.46, p = .646), approached significance for negative valence players. In support of our hypothesis, older adults constructed social environments containing a greater number of positive players, but unexpectedly, they also included a greater number of negative players.

Emotional experience

Participants rated their positive and negative emotional experience before and after completing the social network decision task. To test for age-related differences in emotional experience, we conducted a multilevel linear regression analysis on participants' emotion ratings, including fixed effects for participant age (as continuous), time of measurement (before or after social network task), and emotion valence (positive, negative). A multilevel modeling approach was used as emotional experience was measured on two occasions within participants. To test whether the valence of players on participants' team in the decision task influenced their emotional experience following the task, we included a fixed effect for the proportion of positive players on their team following all five rounds (e.g., 3 positive valence players & 2 negative valence players = 0.60 proportion of positive players)[2]. We also controlled for the total number of players in participants' team in the task. Random intercepts were included for participants to account for repeated measurements. Continuous predictors were grand mean centred. In a second block, we included all possible two-way interaction terms involving age, time of measurement, emotion valence, and proportion of positive players. In subsequent blocks, we included three- and four-way interaction terms. Participants reported stronger positive emotions (M = 4.04) than negative emotions (M = 2.13; b = 1.91, t = 18.99, p < .001). A higher proportion of positive players on participants' team was associated with lower overall ratings of emotional experience (i.e., independent of valence; M = 2.86 vs. M = 3.31, 1 *SD* above and below mean; b = -1.27, t = 2.49, p = .014). There were no other significant main effects.

Emotion valence interacted with time of measurement (b = 1.49, t = 7.78, p < .001). However, this two-way interaction was qualified by an age × time of measurement × emotion valence interaction (b = 0.04, t = 3.55, p < .001). Inspecting Fig. 3, positive emotion was higher and negative emotion was lower with advancing age prior to the social network task, but these age-related differences in emotionality were flattened following completion of the task. Simple slope analysis revealed that prior to the social network task, positive emotion was higher with age (b = 0.01, t = 2.00, p = .047) and negative emotion was lower with age (b = -0.02, t = 3.13, p = .002). Conversely, following the social network task, positive (b = -0.01, t = 0.95, p = .341) and negative (b = 0.00, t = 0.09, p = .928) emotion were no longer associated with age. This occurred because among oldest adults, positive emotion decreased (84 years, b = 1.45, t = 5.34, p < .001) and negative emotion increased (84 years, b = -1.22, t = 4.51, p < .001) following the social network task. Conversely, among youngest adults, there were no significant changes in positive (22 years, b = 0.27, t = 0.93, p = .356) or negative (b = 0.06, t = 0.22, p = .826) emotion.

Moreover, age interacted with emotion valence and the proportion of positive players on participants' team (b = 0.12, t = 3.54, p < .001). Inspecting Fig. 4, for younger age ranges, a higher proportion of positive players was associated with less positive emotional experience (1 *SD* below mean, b = -2.12, t = 2.35, p = .020), but was not associated with negative emotional experience (b = 0.36, t = 0.40, p = .691). Consistent with our expectations, for older age ranges, a higher proportion of positive players (i.e., constructing a more emotionally gratifying social environment) was associated with lower negative emotion (1 *SD* above mean, b = -2.12, t = 2.29, p = .023), but was not associated with positive emotion (b = -0.46, t = 0.50, p = .616). There were no other significant interactions.

Discussion

Participants perceived players who provided positive feedback as positive and players who provided negative feedback as negative, confirming that they were sensitive to the emotional valence of the other players. Moreover, participants were more likely in general to include on their team positive players than negative players, implying that they were sensitive to the emotional valence of players in their social choices. As hypothesized, age interacted with player valence on social choices. Consistent, with the predictions of SST, as age advanced, participants were more likely to keep players on their team who provided positive feedback. However, in contrast with the predictions of SST, participants included a greater number of negative players as age advanced from middle-age into older age.

We also assessed participants' positive and negative emotional experience before and after the social network task. Prior to the task, positive emotion was higher with age and negative emotion was lower with age, echoing the robust finding that emotional well-being improves

[2] We removed three participants who maintained no players in their social network following the final round.

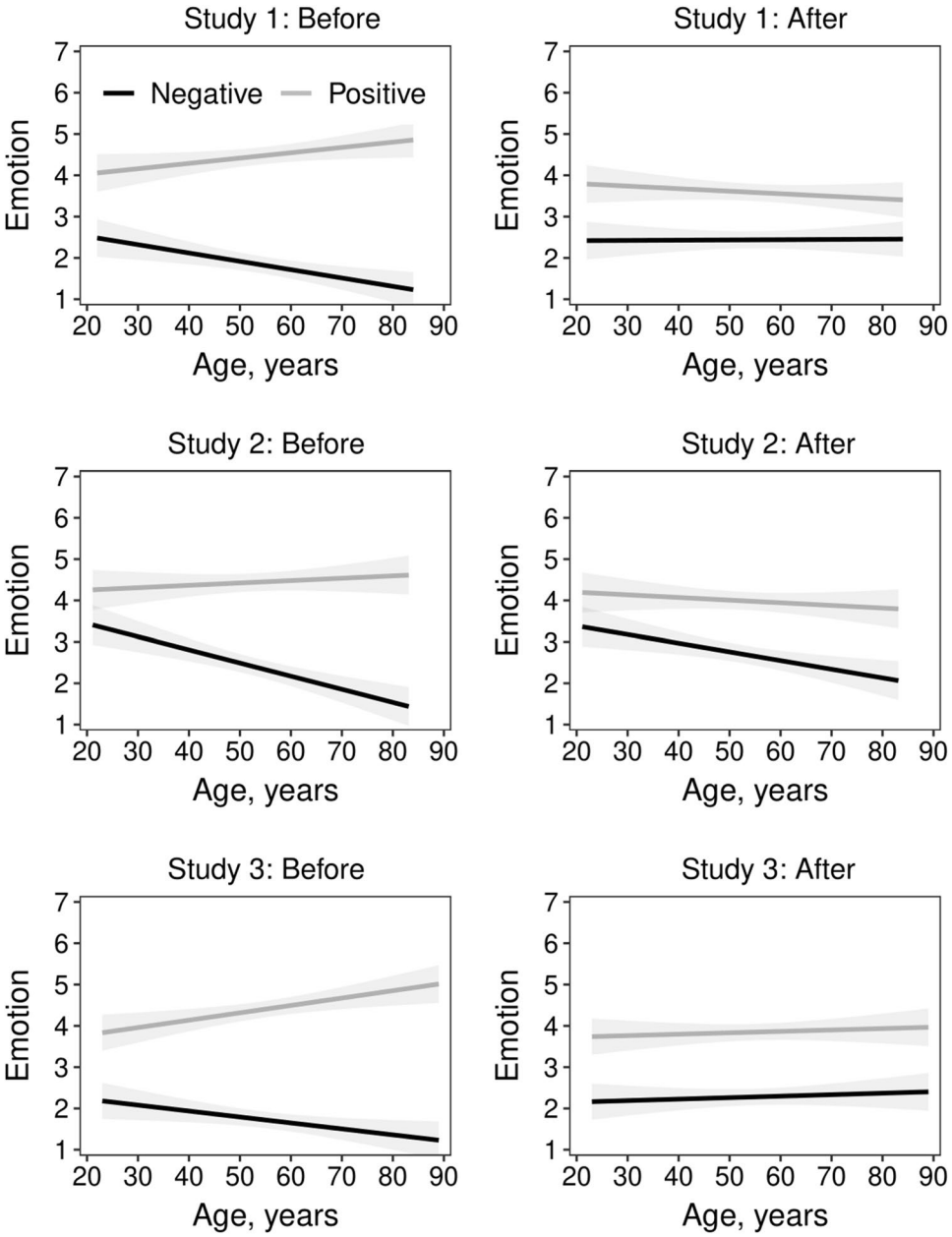

Fig. 3 Association between participant age and positive and negative emotional experience before and after completing the social network task. Shaded areas indicate the 95% confidence intervals

with age (Mroczek & Kolarz, 1998). Yet, following the social network task, positive and negative emotion were no longer associated with age. Specifically, for older adults, positive emotion decreased and negative emotion increased following the task. Additionally, older participants who constructed social environments containing a higher proportion of positive players reported experiencing less negative emotion prior to and following the task.

In Study 1, participants received feedback from other players even if they chose to remove them from their team. This may have discouraged older adults from pruning negative players from their team as doing so would not have distanced them from their negative feedback. The provision of negative feedback from players even if removed from participants' team may also have caused the decrease in positive emotion and increase in negative emotion among older adults following the task.

Study 2

In Study 2, we employed the social network decision task introduced in Study 1 with one important exception: participants received feedback only from players included on their team. Thus, removing negative players from their team would distance participants from their

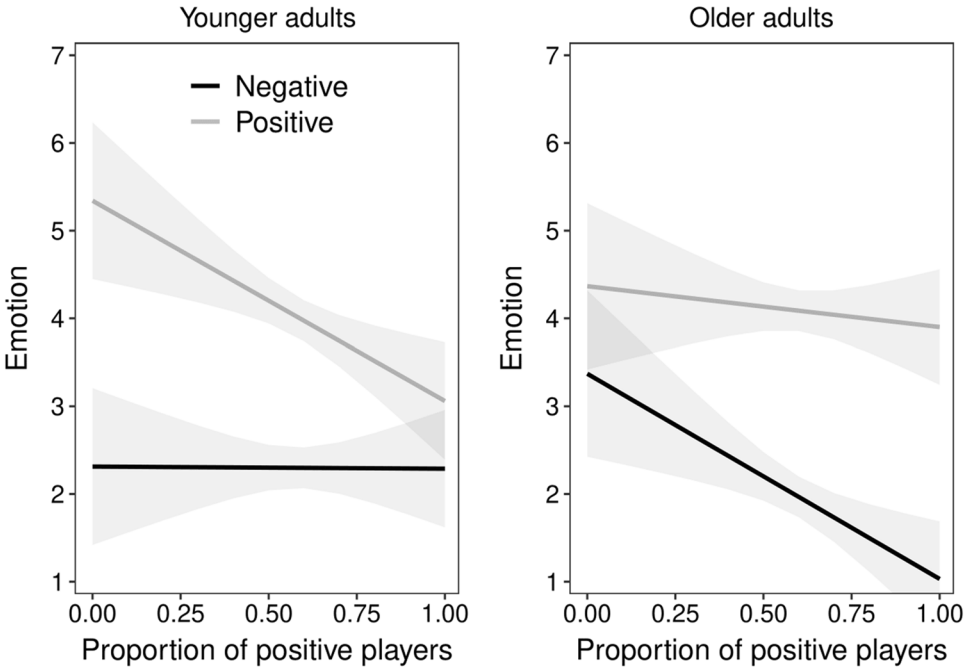

Fig. 4 Study 1: Moderating effects of age on the association between the proportion of positive players in participants' social networks and their emotional experience. Shaded areas indicate the 95% confidence intervals

negative feedback. As in Study 1, we hypothesized that with advancing age participants would maintain a greater number of positive players on their team. In contrast with the findings of Study 1, but in line with the theoretical predictions of SST, we hypothesized that with advancing age participants would maintain fewer negative players on their team.

Methods

Participants

Two hundred twenty six US residents were recruited via Amazon Mechanical Turk. Individuals could not take part if they participated in Study 1. No participants were recruited after initial data analysis. Eighteen participants (8%) were excluded because they failed to provide a date of birth that was within two years of their reported age in years. Our final sample included two hundred and eight participants (57% male; age range = 21–83; mean age = 52.44, $SD = 16.29$) across four age bands (18-40$_{years}$, $n = 60$; 41-60$_{years}$, $n = 59$; 61-70$_{years}$, $n = 58$; +70$_{years}$, $n = 31$), ensuring representation in younger, middle, and older age ranges. Regarding employment, the majority of younger to middle-age adults (≤ 60 years; $n = 103$, 88%) were in full-time employment, whereas over half of older adults (> 60 years; $n = 47$, 54%) were retired. Regarding education, a similar number of younger to middle-age and older adults indicated high school ($n = 8$, 7%; $n = 11$, 12%, respectively) as their highest education attainment, but a higher proportion of younger to middle-age adults than older adults indicated a university degree ($n = 63$, 53%; $n = 24$, 27%, respectively) as their highest education attainment.

Materials and procedure

Social network decision task Participants completed the same social network decision task as in Study 1, with the exception that feedback was only provided to participants by players who were on the participant's team (Fig. 1B).

Emotional experience Participants rated their positive and negative emotional experience following the procedure used in Study 1.

Results

Word search puzzle performance

On average, participants correctly identified 1.94 ($SD = 1.49$) words in total across the five rounds, earning a mean of 5.05 ($SD = 4.94$) points. In contrast with Study 1, linear regression analyses indicated that advancing age was associated with identifying more correct words ($b = 0.01$, $t = 7.27$, $p < .001$) and earning more points overall ($b = 0.02$, $t = 3.31$, $p = .001$).[3]

[3] Participants' performance on the puzzle (number of correct words or total points) was not associated with their social network choices and our results for social network choices were not altered by additionally controlling for participants' performance on the puzzle.

Player valence ratings

Following all five rounds of the social network task, participants rated the valence of the ten other players. A linear regression analysis, including player valence (positive, negative) and participant age (mean centred), confirmed that participants rated positive valence players ($M = 1.69$, $SD = 1.02$) as significantly more positive than negative valence players (M = -1.11, $SD = 1.79$; $b = 2.80$, $t = 19.82$, $p < .001$). In contrast with Study 1, players were rated less positively with advancing age (b = -0.01, $t = 3.35$, $p = .001$). Moreover, age interacted with player valence ($b = 0.03$, $t = 3.33$, $p = .001$). Simple slope analysis revealed that older adults rated negative valence players more negatively than younger adults ($M_{18\ years}$ = -0.21; $M_{83\ years}$ = -2.00; b = -0.03, $t = 4.75$, $p < .001$), but that there was no significant effect of age for positive valence players ($M_{18\ years}$ = 1.69; $M_{83\ years}$ = 1.68; b = -0.00, $t = 0.05$, $p = .964$). One-sample t-tests confirmed that mean valence ratings for positive ($t(207) = 23.75$, $p < .001$) and negative ($t(207) = 8.98$, $p < .001$) players differed significantly from zero.

Social network choices

We conducted our multilevel logistic regression analysis introduced in Study 1 on participants' team choices following all five rounds. The binary dependent variable represented whether (value of 1) or not (value of 0) each player was maintained on the participant's team. Participants were significantly more likely to maintain on their team players who provided positive feedback ($p_{maintain}$ = 0.97) than players who provided negative feedback ($p_{maintain} = 0.84$; $b = 2.01$, $t = 11.43$, $p < .001$). Participants were also more likely to maintain on their team players who scored a higher number of points ($p_{maintain} = 0.96$ vs. $p_{maintain} = 0.90$, 1 SD above and below mean; $b = 0.12$, $t = 5.56$, $p < .001$). In contrast to Study 1, there was a significant linear ($b = 39.65$, $t = 3.97$, $p < .001$), but no significant quadratic ($b = 18.42$, $t = 1.91$, $p = .056$), association with participant age, such that older adults overall included more players on their team. The linear ($b = 40.15$, $t = 3.82$, $p < .001$), but not the quadratic ($b = 15.88$, $t = 1.71$, $p = .087$), effect of age interacted with player valence. A sensitivity power analysis using 100 simulations with an alpha significance criterion of 0.05 and an estimated effect size of $d = 0.50$ (Astivia et al., 2019), indicated an estimated power of 98% to detect the quadratic age × player valence interaction. There were no significant interactions between the linear (b = -0.57, $t = 0.49$, $p = .624$) or quadratic ($b = 0.07$, $t = 0.06$, $p = .949$) effects of age and player points. Figure 2 displays the age × player valence interaction. With advancing age, participants were more likely to maintain players on their team who provided positive feedback ($b_{linear} = 33.95$, $t = 2.39$, $p = .017$; $b_{quadratic}$ = 16.55, $t = 1.20$, $p = .229$), as well as players who provided negative feedback ($b_{linear} = 32.25$, $t = 3.04$, $p = .002$; $b_{quadratic} = 14.79$, $t = 1.46$, $p = .146$).

Emotional experience

We followed our analytic approach introduced in Study 1 to investigate positive and negative experience before and after completing the social network task.[4] Consistent with our findings of Study 1, participants reported stronger positive emotions ($M = 4.21$) than negative emotions ($M = 2.56$; $b = 1.66$, $t = 18.17$, $p < .001$). Including a higher proportion of positive players on participants' team was associated with lower overall ratings of emotional experience ($M = 2.89$ vs. $M = 3.89$, 1 SD above and below mean; b = -2.92, $t = 4.62$, $p < .001$). Moreover, having more players overall on participants' team was associated with lower ratings of emotional experience ($M = 2.98$ vs. $M = 3.79$, 1 SD above and below mean; b = -0.20, $t = 3.63$, $p < .001$).

Emotion valence interacted with time of measurement ($b = 0.74$, $t = 4.19$, $p < .001$) and age ($b = 0.03$, $t = 4.81$, $p < .001$). However, these two-way interactions were qualified by an age × time of measurement × emotion valence interaction ($b = 0.02$, $t = 2.13$, $p = .034$). In line with the findings of Study 1, simple slope analysis revealed that prior to the social network task, negative emotion (b = -0.03, $t = 4.50$, $p < .001$, but not positive emotion, $b = 0.01$, $t = 0.81$, $p = .418$; Fig. 3) decreased significantly with age. Yet, in contrast with Study 1, negative affect still reduced with age (b = -0.02, $t = 2.97$, $p = .003$), albeit to a lesser degree. There was no significant decline in positive affect with age (b = -0.01, $t = 0.91$, $p = .364$; Fig. 3). However, it was still the case that among older adults, positive emotion decreased (83 years, $b = 0.82$, $t = 3.09$, $p = .002$) and negative emotion increased (83 years, b = -0.63, $t = 2.37$, $p = .018$) following the social network task (Fig. 3). Among younger adults, there were no significant changes in positive (21 years, $b = 0.06$, $t = 0.24$, $p = .812$) or negative ($b = 0.04$, $t = 0.16$, $p = .872$) emotion (Fig. 3). In contrast to Study 1, there was no significant interaction involving participant age, emotion valence, and the proportion of positive players on participants' team.

Discussion

We altered our social network decision task in Study 2, such that participants no longer received feedback from

[4] We removed five participants who maintained no players in their social team following the final round.

players they removed from their team. Yet, we broadly replicated our findings of Study 1 regarding age differences in social choices. With advancing age, participants included a greater number of positive players on their team. Age differences in negative player inclusion were even larger, such that older participants, but not younger or middle-age participants, included a similar number of positive and negative players on their team. Thus, in contrast with the theoretical propositions of SST, older adults pruned fewer negative players from their social environment than did participants in the younger or middle-age ranges, even when doing so would distance them from the negative comments of other players.

Among older adults, negative emotion increased following the social network decision task, but to a lesser extent than in Study 1. As such, older adults continued to experience less negative emotion than younger adults even following the task. One explanation for the reduced negative emotional impact of the task in older age is that participants no longer received negative feedback from players they removed from their team, reducing their exposure to negative comments. However, it is important to acknowledge that oldest participants maintained a similar number of positive and negative players on their team. Moreover, the proportion of positive players that participants maintained on their team was not associated with emotional experience. Thus, older adults did not appear to make social choices that rewarded emotional gratification.

Study 3

In Study 3, participants began the social network decision task with none of the other players initially on their team, requiring them to include players to construct their team. This method diverges from our approach in Studies 1 and 2, but enabled us to test whether constructing one's social environment as opposed to pruning one's social environment elicits the same socioemotional processes with age we observed in Studies 1 and 2. In terms of emotion regulation, Studies 1 and 2 required participants to engage a situation modification strategy, pruning players from their team. Yet, doing so meant forgoing the points earned by other players, entailing a more complex cost-benefit analysis. Indeed, pruning social partners from one's real social network would entail a considerably more complex trade-off between multiple costs and benefits (e.g., social support; Kahn & Antonucci, 1980; Uchino, 2009). Conversely, in Study 3, participants began the task without accumulating any points from other players until they were included on the participant's team. Empowering participants with the choice of players to include and exclude in their social environment may encourage more selective social choices according to the emotional valence of other players. In other words, Study 3 called for a situation selection strategy, which is more volitional and thus may be more likely to elicit age-related differences in socioemotional choices.

Methods

Participants

Two hundred thirty six US residents were recruited via Amazon Mechanical Turk. Individuals could not take part if they participated in Study 1 or Study 2. No participants were recruited after initial data analysis. As in Study 1, participants ($n = 18$; 8%) were excluded if they failed to provide a date of birth at the beginning of the study that was within two years of their reported age in years at the end of the study. Our final sample included two hundred eighteen participants (48% male; age range = 23–89; mean age = 55.42, $SD = 16.32$) across four age bands ($18\text{-}40_{\text{years}}$, $n = 53$; $41\text{-}60_{\text{years}}$, $n = 55$; $61\text{-}70_{\text{years}}$, $n = 59$; $+70_{\text{years}}$, $n = 51$), representing younger, middle, and older age ranges. Regarding employment, the majority of younger to middle-age adults (≤ 60 years; $n = 95$, 88%) were in full-time employment, whereas over a third of older adults (> 60 years; $n = 40$, 36%) were retired. Regarding education, a similar number of younger to middle-age and older adults indicated high school ($n = 9$, 8%; $n = 10$, 9%, respectively), some college ($n = 34$, 31%; $n = 38$, 35%, respectively), or a university degree ($n = 51$, 47%; $n = 36$, 33%, respectively) as their highest education attainment.

Materials and procedure

Social network decision task Participants completed the social network task used in Study 2, with one important exception: none of the players were initially included on participants' team. Hence, participants did not receive feedback from players until they included them on their team, and when players were subsequently removed their feedback was no longer visible. As such, participants were required to construct, rather than refine, their social network. On the first round, participants could add players to their team by clicking an option box corresponding to the player(s) they wished to include. On later rounds, participants could add additional players or remove players from their team by clicking corresponding 'add' or 'remove' option boxes (Fig. 1B). We also increased the number of rounds from five to seven as participants needed to first include players on their team

before they received valenced feedback that could inform their choices to exclude players.

Emotional experience Participants rated their emotional experience following the procedure used in Studies 1 and 2.

Results

Word search puzzle performance

On average, participants correctly identified 3.28 ($SD = 1.98$) words in total across the seven rounds, earning a mean of 9.10 ($SD = 7.33$) points. Linear regression analyses indicated that advancing age was associated with identifying fewer correct words (b = -0.02, $t = 9.17$, $p < .001$) and earning fewer points overall (b = -0.12, $t = 13.48$, $p < .001$).[5]

Player valence ratings

Following all seven rounds of the social network decision task, participants rated the valence of other players. However, as participants received feedback only from players they included on their team, they were asked to provide valence ratings only for players for which they had received feedback. A linear regression analysis, including player valence (positive, negative) and participant age (mean centred), confirmed that participants rated positive players ($M = 3.56$, $SD = 0.93$) as significantly more positive than negative players ($M = 0.43$, $SD = 2.23$; $b = 3.13$, $t = 17.77$, $p < .001$). There was no significant association with age ($b = 0.00$, $t = 0.53$, $p = .597$). In a second block, there was no significant age × player valence interaction. In contrast with Studies 1 and 2, one-sample t-tests revealed that mean valence ratings were significantly above zero for both positive ($t(188) = 52.17$, $p < .001$) and negative ($t(192) = 2.69$, $p = .008$) players. To further investigate the positive ratings given to negative players, we conducted a linear regression analysis on valence ratings for negative players, including whether or not players were included in participants' final team following all seven rounds. This analysis revealed that players who were on participants' final team received a negative mean rating (M = -0.11, $SD = 2.09$), whereas players who were not on participants' final team received a positive mean rating ($M = 1.71$, $SD = 2.63$; b = -1.82, $t = 5.95$, $p < .001$). This finding suggests that participants rated differently negative players for whom they could no longer assess the valence of their feedback.

[5] Participants' performance on the puzzle (number of correct words or total points) was not associated with their social network choices and our results for social network choices were not altered by additionally controlling for participants' performance on the puzzle.

Social network choices

We conducted our multilevel logistic regression analysis used in Studies 1 and 2 on participants' team choices following all seven rounds.[6] The binary dependent variable represented whether (value of 1) or not (value of 0) each player was maintained on the participant's team. The analysis revealed that participants were significantly more likely to maintain on their team players who provided positive feedback ($p_{maintain} = 0.56$) than players who provided negative feedback ($p_{maintain} = 0.29$; $b = 1.15$, $t = 10.74$, $p < .001$). There was no significant linear (b = -8.35, $t = 1.55$, $p = .122$) or quadratic (b = -0.60, $t = 0.11$, $p = .912$) association with age. There was a significant interaction between a linear ($b = 11.03$, $t = 2.31$, $p = .021$), but not a quadratic ($b = 3.18$, $t = 0.65$, $p = .514$) effect of age and player valence. A sensitivity power analysis using 100 simulations with an alpha significance criterion of 0.05 and an estimated effect size of $d = 0.50$ (Astivia et al., 2019), indicated an estimated power of 100% to detect the quadratic age × player valence interaction. Figure 2 displays the linear age × player valence interaction. With advancing age, participants were significantly less likely to keep players on their team who provided negative feedback (b_{linear} = -11.95, $t = 2.04$, $p = .042$; $b_{quadratic}$ = -2.81, $t = 0.47$, $p = .640$), but were not significantly more likely to keep players on their team who provided positive feedback (b_{linear} = -2.23, $t = 0.53$, $p = .596$; $b_{quadratic} = 0.79$, $t = 0.19$, $p = .850$; Fig. 2).

Emotional experience

We followed our analytic approach introduced in Studies 1 and 2 investigate positive and negative experience before and after completing the social network task.[7] Participants reported stronger positive emotions ($M = 4.12$) than negative emotions ($M = 2.00$; $b = 2.13$, $t = 22.86$, $p < .001$). A higher proportion of positive players on participants' team was associated with lower overall ratings of emotional experience ($M = 2.90$ vs. $M = 3.22$, 1 SD above and below mean; b = -0.60, $t = 2.25$, $p = .026$).

[6] We did not include total points earned by the players as a fixed effect as this caused convergence issues when included with player valence in the same model. However, when a fixed effect for total points was included in a separate model, participants were more likely to include players who earned more points ($b = 0.17$, $t = 12.52$, $p < .001$), but there were no significant interactions involving participant age.

[7] We removed 24 participants who included no players in their social network following the final round.

Emotion valence interacted with the proportion of positive players on participants' team ($b = 0.88$, $t = 2.66$, $p = .008$). Simple slope analysis revealed that a higher proportion of positive valence players was associated with significantly lower negative emotion ($b = -0.81$, $t = 2.28$, $p = .024$), but not positive emotion ($b = 0.07$, $t = 0.19$, $p = .848$). Emotional valance also interacted with time of measurement ($b = 1.12$, $t = 6.29$, $p < .001$), and participant age ($b = 0.02$, $t = 2.95$, $p = .003$). However, these latter interactions were qualified by a participant age × time of measurement × emotion valence interaction ($b = 0.03$, $t = 3.00$, $p = .003$). There were no other significant interactions. Inspecting Fig. 3, positive emotion was higher and negative emotion was lower with advancing age prior to the social network task, but these age-related differences in emotionality were flattened following completion of the task. Simple slope analysis revealed that prior to the task, positive emotion was higher with age ($b = 0.02$, $t = 2.85$, $p = .005$) and negative emotion was lower with age ($b = -0.01$, $t = 2.30$, $p = .022$; Fig. 3). Conversely, following the social network task, positive ($b = 0.00$, $t = 0.55$, $p = .584$) and negative ($b = 0.00$, $t = 0.57$, $p = .566$) emotion were no longer associated with age (Fig. 3). This occurred because among older adults, positive emotion decreased (89 years, $b = 1.05$, $t = 3.64$, $p < .001$) and negative emotion increased (89 years, $b = -1.17$, $t = 4.07$, $p < .001$) following the social network task. Conversely, among younger adults, there were no significant changes in positive (23 years, $b = 0.09$, $t = 0.34$, $p = .732$) or negative ($b = 0.02$, $t = 0.06$, $p = .950$) emotion.

Discussion

In contrast with Studies 1 and 2, when constructing their social environment, participants included fewer negative players on their team as age advanced. Conversely, there were no age differences in the number of positive players participants maintained on their team. As such, older adults produced a relatively more positive emotional environment, which is consistent with the theoretical proposition of SST that older adults engineer their social environment to construct more emotionally gratifying social experiences.

Moreover, containing a higher proportion of positive valence players was associated with experiencing less negative emotion prior to and following the task. Thus, social choices were associated with emotional experience. However, even though older adults constructed a more positive environment, and doing so was associated with experiencing less negative emotion, for older adults, positive emotion decreased and negative increased following the social network task.

General discussion

Do older adults construct more emotionally gratifying social environments than younger adults? To address this theoretically important question, we designed a social network decision task that enabled participants to construct their own social environment within a controlled setting. In three studies, participants chose to include or remove 'players' from their team according to players' valenced comments and their performance on word search puzzles. In all three studies, participants rated positive valence players positively and negative valence players negatively, confirming that they were sensitive to the emotional valence of players. Participants also included a larger number of positive players on their team than negative players, implying that they were sensitive to the emotional valence of players in their social choices. Moreover, older participants in Study 1 and participants in general in Study 3 who included a higher proportion of positive players on their team (i.e., constructing a more emotionally gratifying social environment) also reported experiencing less negative emotion prior to and following the task, which implies that their social choices were associated with their emotional experience.

According to SST, older adults actively construct their social environment to satisfy emotional gratification goals (Carstensen et al., 1997; Charles & Carstensen, 2010). Our studies provide new evidence that partially supports this claim. In Studies 1 and 2, all players in the social network decision task were initially on the participant's team and could be removed (i.e., pruned) following each round. Under these conditions, participants included a greater number of positive players with advancing age. In Study 3, participants instead began the task initially with none of the players on their team, requiring them to construct their team before pruning players. Under these latter conditions, participants included fewer negative players with advancing age. Together, these findings support the claim of age-related differences in socioemotional choices and indicate social choices in older age that prioritize positive social partners over negative social partners.

However, our novel methodology revealed that the socioemotional processes by which people choose among social members depends on the circumstances in which people shape their social environment. When participants began the social network decision task with all players initially on their team, older adults maintained a greater number of negative valence players on their team than participants in younger (Study 2) and middle-age (Studies 1 and 2) ranges. This occurred even when the positive emotional valence of their team (i.e., the proportion of positive players) was associated with experiencing less negative emotion. Apparently, when pruning an existing social environment, older adults

are more tolerant of negative social members than their younger or middle-age counterparts. While this finding does not dispel research supporting the claim that older adults prune their social networks to promote positive emotional experiences (e.g., Charles & Carstensen, 2010; English & Carstensen, 2014), it does suggest that age-related socioemotional processes may be more nuanced than proposed by SST (Carstensen, 1995, 2006). Notably, our findings suggest that older adults may be more tolerant to negative social actors who are already enmeshed within their social environment.

Factors other than active pruning may lead to age-related differences in social network composition. Significant life events occurring across adulthood, including transition to parenthood, relocation, divorce, and death of a spouse, partially account for age-related reductions in people's social networks (Wrzus et al., 2013). Moreover, some life events that reduce a person's overall social network size, such as loss of a spouse and divorce, also focus people on close supportive familial relationships at the expense of more peripheral social ties (Murphy et al., 1998; Sprecher et al., 2006), mirroring apparent social network pruning predicted SST (Cartsensen, 1995, 2006). According to social convoy theory, whereas close supportive relationships (e.g., spouses, core family) are relatively stable across adulthood, peripheral relationships (e.g., acquaintances, work colleagues) are less stable and more affected by life circumstances (Antonucci & Akiyama, 1987; Kahn & Antonucci, 1980).

Our current findings draw a theoretically important distinction between pruning existing social environments and constructing new social environments. In terms of emotion regulation, pruning existing social environments can be understood as requiring a *situation modification* strategy, whereas constructing new social environments can be thought of as requiring a *situation selection* strategy. While both types of strategy are proactive in so far as shaping one's social environment (Charles, 2010; Urry & Gross, 2010), situation selection requires an ability to predict accurately one's emotional experiences in specific situations (Urry & Gross, 2010). Older adults have been shown to be better than their younger counterparts are at predicting their emotional arousal (Nielsen et al., 2008). Thus, afforded by their ability to predict their future emotional states, older adults may prefer to use situation selection, rather than situation modification, as a strategy for curating their social environment. Furthermore, older adults tend to turn to their social network members for social support (e.g., Cohen & Wills 1985; Feeney & Collins, 2015; Kahn & Antonucci, 1980), and thus may be more tolerant of negative emotional experiences involving existing members of their social environment. Compared to their younger and middle-age counterparts, older adults report less negative emotion when appraising a recent event in which they were upset by a member of their social network (Birditt & Fingerman, 2003) and rate their marital partner's behaviors more positively when discussing marital conflict than do objective raters of their partner's behavior (Story et al., 2007). Likewise, older adults experience more intense hurt feelings following rejection (Cheng & Grühn, 2015), and show greater activation in brain regions associated with the retrieval of personal information when picturing socially isolated others (Beadle et al., 2012). This might make them more sensitive to the emotional consequences of rejecting people who are already part of their social groups, even if doing so undermines socioeomotional regulatory goals. Thus, in social contexts, pruning social partners from an existing social network entails consideration of the associated costs. In Studies 1 and 2, removing players meant forgoing points earned by other players, requiring an analysis of the associated costs (i.e., loss of points). Our observed absence of the typical age-related positivity effect—a preference for positive over negative emotional experiences—can be attributed to the presence of competing cost-benefit goals (see also, Depping & Freund, 2013; Rolison, 2019) and a preference in older age for situation selection over situation modification as a strategy for curating one's social environment.

Conversely, older adults may seek emotional gratification, rather than engage support-seeking behaviors, when evaluating new potential social partners, selecting positive social encounters over negative social encounters. The above distinction explains why older participants constructed more emotionally rewarding social environments in the social network decision task when they were required to proactively include other players to construct their social environment. In terms of emotion regulation, the conditions in Study 3 engaged a situation selection strategy. As participants began the task without accumulating any points from other players until they were included on the participant's team, this empowered older adults to curate their social environment. While the extant research has focussed on the socioemotional processes underlying pruning of existing social networks, it is important to acknowledge that older adults must also construct new or partially new social environments. For example, older adults who move into a residential home or accept care support at home, must actively select among new social partners. Our findings identify an important boundary condition of the age-related positivity effect in social partner choice and integrate SST with a distinction between situation modification and situation selection strategies in emotion regulation.

Regarding emotional experience, our studies replicated the robust finding that positive emotion increases with age and negative emotion decreases with age, indicative of improvement in emotional well-being (Mroczek & Kolarz, 1998). Yet, in all three studies, positive emotion decreased and negative emotion increased among older adults following the social network decision task. We speculated that

exposure to negative feedback from players in Study 1, even after their removal from the participant's team, may have caused the decrease in positive emotion and increase in negative emotion among older adults following the task. Yet, even when participants no longer received feedback from players removed from their team in Studies 2 and 3 older adults experienced a decline in emotional experience. This was the case even though in Study 3 older adults constructed a more positive environment (i.e., a higher proportion of positive players) than younger and middle-age adults, and doing so was associated with experiencing less negative emotion.

Moreover, constructing a more positive environment in the social network decision task was associated with less negative emotional experience prior to and following the task. According to SST, older adults actively construct emotionally gratifying social environments to promote positive emotional experiences, rewarded by subsequent benefits in emotional well-being (Carstensen, 1005; 2006). Independent of age, the experience of negative emotion in association with one's social network is associated with negative emotional experiences in daily life (English & Carstensen, 2014). Our current findings indicated instead that emotion drove socioemotional choices rather than resulting from emotionally gratifying choices. This is because participants' social choices were associated with their emotional experience, regardless of whether this was reported before or after the social network task. Had emotional experience changed following the task according to participants' social choices, this would have implied that participants' social choices had subsequent effects on their emotional experience. However, our conclusion is tentative and our findings do not necessarily contradict studies of real life social networks. In particular, as we did not find that participants' social choices had subsequent effects on their emotional experience, it is possible that the valence of the feedback provided by other players was not sufficiently strong to influence subsequent emotional experience. In a prior study designed to probe the causal link between age-related positivity effects and subsequent emotional experiences, Isaacowitz et al. (2008) used mood induction to necessitate mood regulation prior to tracking participants' eye fixations for emotionally valenced synthetic faces. The logic of this approach is that participants could moderate their attention to the valenced stimuli to regulate their mood, such as by orienting their attention toward positively valenced stimuli and away from negatively valenced stimuli to improve their mood following negative mood induction. A fruitful avenue for future research would be to further disentangle emotional experience from social choices and subsequent experiences. One method could involve mood induction prior to the social network decision task in order to bring about a need for mood regulation. However, the extent to which an age-related positivity effect results in emotional outcomes may depend also on the availability of executive resources necessary for mood regulation (Isaacowitz et al., 2009). Not all older adults may experience beneficial mood changes as a result of preferential processing of valenced stimuli. Thus, future research would also benefit from assessing moderating effects of individual differences in executive resources on the link between social choices and subsequent mood states.

Limitations and future directions

In the current studies, participants made social choices on the social network decision task according to the points other players earned and the valence of their feedback. Participants were more likely to include positive (vs. negative) valence players and players who earned a greater number of points, indicating that both emotional valence and points were important to participants' social choices. Yet, it is necessary to acknowledge that the social environment participants modified or constructed on the task was short-lived and relatively simple compared to the rich and highly complex nature of people's real world social networks. The social network decision task does, however, provide controlled conditions for empirical tests of theoretical assertions that are difficult to assess with people's naturally occurring social environments. In the current studies, we did not manipulate participants' goals. Participants were not told to earn as many points as possible or to prioritize emotional gratification. Future, research could manipulate participants' goals. In Livingstone and Isaacowitz (2015), younger adults actively chose to spend more time viewing positive (vs. negative) material (i.e., implying a situation selection strategy) when given the goal to minimise their negative emotion. We speculate that younger adults may also make more positive (vs. negative) social choices when constructing their social environment on the social network decision task if provided a similar emotion regulation goal. Future studies could also investigate other tenets of SST, such as that goal pursuit is driven by perceptions of one's time horizon (Carstensen, 1995, 2006). For example, younger and older adults could be asked to imagine scenarios that manipulate their perceived time horizon to investigate effects on their social choices (Fung et al., 1999).

We measured participants' valence ratings for other players on the social network task. As older adults report less negative emotion when upset by a social partner (e.g., Birditt & Fingerman, 2003) and rate the behavior of their romantic partner more positively than objective rates when discussing marital conflict (Story et al., 2007), we could have expected older participants to rate other players more positively than younger participants. In Studies 1 and 3, there were no age differences in participants' valence ratings. In Study 2, older adults actually rated negative

valence players more negatively than did younger adults. Thus, our findings do not indicate that older adults have biased perceptions of others, in so far as perceiving other's negative behavior more positively. However, our findings may not reflect how people perceive their close social partners (e.g., spouse) with whom they have a meaningful relationship and emotional investment. Further, participants rated other players only after making social choices about them on the task. In Study 3, it emerged that participants' valence ratings depended on whether players were included on their final team at the end of the task. Future studies could assess participants' valence ratings for other players' feedback prior to the task, which would enable a comparison with their ratings of players following their social choices on the task.

In Study 2, we modified the social network decision task, such that participants no longer received feedback from players once excluded from their team. Our motivation was to enable participants to avoid the negative feedback of negative players by excluding them. In Study 3, participants instead began the task with none of the players initially on their team, requiring them to *construct* their team. As participants could only view the feedback of team members, this meant that participants could only decide to include players based on their performance, and not the valence of their feedback. However, we nonetheless found that as age advanced participants maintained on their team fewer negative players. Future research could explore alternative methodological approaches that would enable participants to include players based on both their performance and the valence of their feedback when constructing their team on the social network decision task. One such approach would be to provide participants the option of viewing feedback of individual players not currently included on their team. In doing so, participants would be able to use a player's feedback, as well as their performance, to decide whether to include them, but would also be able to avoid negative feedback by not choosing to view feedback from players they are not considering to include.

Conclusion

In conclusion, our social network decision task revealed that the socioemotional processes by which people choose among social members depends on the circumstances in which people shape their social environment. Our findings imply a distinction between pruning existing social environments and constructing new social environments, where apparent social network pruning is influenced by social support-seeking behavior and social choices in new social environments is driven by socioemotional processes that prioritize positive emotional experiences. In terms of emotion regulation, the distinction between modifying an existing social environment and constructing a new social environment maps onto distinct situation modification and situation selection strategies. Our findings further suggest that while socioemotional processes drive social choices, they do not necessarily result in benefits in emotional well-being.

Acknowledgements The raw data are available at: https://osf.io/xawrm/?view_only=32e209187cf84ba7bf99be12ac9094c7. The studies were not pre-registered.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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