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Research Article

Social Cognitive Abilities Predict Unique Aspects of Older Adults' Personal Social Networks

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Abstract

Objectives: The current study explores whether personal social network characteristics are associated with older adults' memory and/or social cognitive function (e.g., ability to infer other's mental states—theory of mind).
Method: 120 older adults completed a social network interview, a memory measure, and 2 core measures of social cognitive functions: emotion recognition and theory of mind.
Results: Variation in memory and social cognitive abilities predicted distinct aspects of older adults' social networks. Having better memory predicted having larger, less-dense social networks, but better theory of mind was associated with having at least one acquaintance in the network, and having more heterogeneous social relationships within the network.
Discussion. Together our findings suggest that disparate social cognitive abilities may serve unique functions, facilitating maintenance of beneficial social connections.

Keywords: Older adults, Social cognitive function, Social networks, Theory of mind

Social connectedness plays a key role in older adults' physical and mental well-being (Boss et al., 2015; Kuiper et al., 2015). Longitudinal and cross-sectional studies have found that, even when controlling for other risk factors (e.g., socioeconomic status, cognitive and physical health), having large, supportive personal social networks—defined by the quantity and quality of social relationships that individuals have with others—predicts older adults' longevity, physical and mental health, and cognitive function over time (Barnes et al., 2004; Kelly et al., 2017; Luo et al., 2012). As people age, the size of their personal social networks declines because older adults have fewer acquaintances in their social networks than do young adults (English & Carstensen, 2014). Prominent theories on aging suggest that these age-related shifts in social networks are driven by older adults' motivational goals (e.g., Carstensen et al., 1999). The current investigation explores an alternate, but not mutually exclusive, hypothesis: that the structure, composition, and function of older adults' social networks may be related to, at least in part, age-related changes in older adults' social cognitive function.

Longitudinal and cross-sectional studies have demonstrated that older adults' general cognitive ability is associated with their social network structure (e.g., size, interconnectedness within the network; Giles et al., 2005; Seeman & Berkman, 1988). Better general cognitive function is also associated with having more network range, that is an expansive, heterogeneous network with a mix of close relationships and acquaintances, and/or a network that contains a range of different types of relationships (e.g., family, friends, neighbors, and coworkers; Cornwell, 2009a, 2009b; Iwase et al., 2012). One reason for this might be that network range is associated with access to diverse resources and novel information and opportunities (Perry et al., 2018; Perry et al., 2021), which may provide wider types of support and social stimulation associated with better cognitive reserve (Perry et al., 2021). Finally, older adults' subjective and objective well-being is associated with having better social network function (Chen & Feeley, 2014; Cornwell & Waite, 2009; Seeman et al., 2001), notably the availability of emotional and/or instrumental support (e.g., Uchino et al., 1996).

The goal of the current study was to determine whether social cognitive function—the process by which people understand, store, and apply information about others—predicts unique aspects of older adults' social networks, beyond those associated with general cognitive function. Because social cognitive function is essential for successfully navigating social interactions (for review, see Krendl & Heatherton, 2009; also Hauck et al., 1998), and is largely independent of general cognitive function (for review, see Moran, 2013), it may play an important role in older adults' social networks. Consistent with this assertion, an emerging body of research has found that although some general cognitive function (memory) relates to aspects of older adults' social networks (e.g., most frequent interaction partners; Stiller & Dunbar, 2007), certain social cognitive functions (e.g., theory of mind, empathy) predict other aspects of the network (e.g., size, network support; Huo et al., 2020; Radecki et al., 2019). However, existing empirical work has not examined the possibility that distinct social cognitive functions are related to unique aspects of older adults' social networks. Thus, the goal of the current investigation was to determine whether aspects of older adults' social networks—its structure (size, density, closeness), range (diversity in the types of social relationships in the network, presence of peripheral ties), and function (types of support offered)—are related to unique social cognitive functions (e.g., theory of mind), or to general cognitive function (e.g., memory).

Developing and maintaining social connections requires social cognitive abilities: notably, the ability to recognize others' emotional states (emotion recognition) and understand others' mental states (theory of mind; for review, see Krendl & Heatherton, 2009). Core social cognitive functions—recognizing emotions, understanding others' intentions, and detecting deception—decline over the life span (Henry et al., 2013; Moran, 2013; Ruffman et al., 2008). Despite playing a key role in social functioning (Bishop-Fitzpatrick et al., 2017; Carton et al., 1999; Watson et al., 1999), existing empirical work has not examined the possibility that deficits in these core social cognitive functions (e.g., emotion recognition, theory of mind) are related to having a restricted network range, structure, or function.

Theory of mind is particularly focal in the current study because it plays a key role in facilitating successful social interactions (Bishop-Fitzpatrick et al., 2017; Watson et al., 1999). Meta-analyses suggest that cognitive theory of mind (understanding others' beliefs or intentions) shows greater age-related impairments than does affective theory of mind (understanding other's emotions; Henry et al., 2013). However, there are several key limitations in extant measures of theory of mind within aging research. First, they often use impoverished stimuli that rely on a single modality (e.g., reading a story, looking at a cartoon; Kliemann & Adolphs, 2018; but see Halberstadt et al., 2011), which reduces the ecological validity of the results. Second, they typically measure either cognitive or affective theory of mind, but not both (for meta-analysis, see Henry et al., 2013). Third, they often collapse its unique subcomponents (e.g., understanding motivation, inferring intentions) into a single measure of either cognitive or affective theory of mind (Fischer et al., 2017; Wang & Su, 2013), thereby reducing its potential sensitivity.

In the current study, we examined both cognitive and affective theory of mind, but we divided cognitive theory of mind into three subcomponents: inferring motivation, inferring beliefs, and detecting deception. We focused on the subcomponents of cognitive theory of mind because they play distinct roles in navigating social interactions (e.g., Moran et al., 2011; Moran, 2013). For example, inferring intentions predicts moral judgments (Moran, 2013), whereas inferring beliefs facilitates social interactions (Frith & Frith, 2001). Moreover, individuals may have impairments on one domain (e.g., inferring intentions), but not others (e.g., inferring beliefs; Moran et al., 2011). Thus, an important theoretical contribution of the current work will be to disentangle the potential impact of three key subcomponents of cognitive theory of mind—detecting deception, inferring beliefs, and inferring intentions—as well as affective theory of mind (understanding emotions) on social connectedness.

Although there is some evidence that some theory of mind processes (e.g., affective theory of mind) rely on other social cognitive abilities (e.g., emotion recognition; Halberstadt et al., 2011), it is important to disentangle the distinct contributions made by each in order to understand how and why aging disrupts social cognition. The current study was exploratory in nature, but builds on prior work showing that social cognitive function (e.g., theory of mind) predicts some aspects of older adults' social networks (e.g., network function), whereas general cognitive function (e.g., memory) relates to others (e.g., network structure; Huo et al., 2020; Stiller & Dunbar, 2007). Because prior work used relatively narrow measures of older adults' social networks and social cognitive function, the current study expands this work by utilizing multiple measures of older adults' core social cognitive functions (including a novel theory of mind measure), a measure of general cognitive ability, and a rigorous social network interview. To address the question of whether deficits in general or social cognitive function are related to having a restricted network range, structure, or function, a sample of young adults completed the same measures of general and social cognitive function so we could identify the tasks on which age deficits were most pronounced. In turn, those tasks were used to identify the extent to which, if at all, older adults' social cognitive abilities predict the structure, range, and function of their social networks beyond general cognitive abilities.

Method

In total, 120 older adults (ages 62–89 years old; M_{Age} = 74.64 years, *SD* = 7.15; 64 female) were recruited from the Bloomington, Indiana community. Participants were recruited via newspaper advertisements and through a research database maintained by the first author. They were primarily White (96.7%), well educated (86.7% had a college degree or higher), and not cognitively impaired (as indicated by scoring >26 on the Mini-Mental State Examination; Folstein et al., 1975). During the session, older adults completed a social network interview, as well as a social cognitive battery that included measures of emotion recognition and cognitive and affective theory of mind, and a general cognitive measure (Logical Memory II; Wechsler, 2009). A subset of older adults (*N* = 89) also completed a social memory task (see Supplementary Material).

Social Network Interview

Older adults completed a structured network interview adapted from the PhenX Social Networks Battery toolkit (Hamilton et al., 2011; Perry & Pescosolido, 2010). The interview elicited names of individuals in a respondent's social network with whom they discussed "important matters," as well as supportive ties, significant family members, neighbors, coworkers or fellow volunteers, and negative/burdensome ties (Perry et al., 2018). After the full list of names was provided, questions were asked about each person in the network, including density (interconnectedness between network members) and types of support offered by each network member (instrumental support: has this person … tried "to help you with daily chores, like shopping for food, cooking, fixing things, cleaning your apartment/house, or taking you places that you need to go?"; emotional support: has this person … listened "to you when you were feeling down or upset?"). Instrumental and emotional support were combined into a global measure of network support. Respondents also selected from a list of 18 possibilities the type(s) of social relationships attributed to each network member (e.g., family member, friend, leisure partner, coworker, neighbor). See Table 1 for a description of network variables.

An important benefit to using the social network interview instead of proxy questions (e.g., "How many good friends do you have?" or "Do you feel you receive adequate social support?") to capture older adults' social networks is that proxy measures may misrepresent an individual's personal social network, in part because it is cognitively difficult to accurately aggregate across numerous social relationships (Burt, 1987). By eliciting various types of ties using multiple name generators, it is possible to achieve a more comprehensive and accurate measure of social networks (Perry et al., 2018). Moreover, responses on the social network interview are not constrained by older adults' memory ability (Roth et al., 2020). The social network interview was completed prior to other measures to avoid priming the participant to name particular kinds of relationships. The order of the remaining measures was randomized across participants.

Emotion Recognition

The Diagnostic Analysis of Nonverbal Accuracy (DANVA 2) scale (Nowicki & Duke, 1994) was used to measure

Table 1. Definition of Each Social Network Measure and the Range for Each Variable Within the Dataset

	Network variable	Definition	Range
Network structure	Size	Overall # of network members	2–32
	Density	Interconnectedness between network members depicted as a proportion of the potential connections that exist between each unique individual in the network; higher values denote more densely connected networks.	0–1
Network range	Diversity	The number of different types of social relationships (family, friend, coworker, neighbor) represented in the network	2–10
	Peripheral ties	Individuals in the network to whom the older adult is "not very close." This is coded as 1 if there are any peripheral ties in the network, and 0 if there are none	0–1
Network function	Overall support	Total # of types of support provided by each network member (instrumental + emotional)	0–5
	Instrumental support	Network members provide help with tasks (e.g., shopping, transportation, meals)	0–3
	Emotional support	Network members, e.g., "listened when you were feeling down"	0–2

emotion recognition. The DANVA2 is a well-validated, widely used measure of emotion recognition (e.g., Baum & Nowicki, 1998) that assesses emotion recognition accuracy. The task uses pictures of 24 faces conveying happiness, anger, fear, or sadness (six each), and 24 audio files (without pictures) stating the same sentence ("I'm going out of the room now, and I'll be back later") in tones that reflect happiness, anger, fear ful, or sadness (six each). The DANVA2 has been previously used in aging research to measure emotion recognition to static (images) and dynamic (auditory files) stimuli (e.g., Krendl & Ambady, 2010). The stimuli were presented in randomized order across counterbalanced blocks. At the conclusion of each trial type, participants were prompted to select from four possible options (happy, angry, fear, and sad) which emotion had been just been conveyed. In order to simplify our model and reduce the likelihood of spurious findings, we focused on the dynamic (auditory) channels because these better paralleled the dynamic nature of the novel theory of mind task.

Theory of Mind

Cognitive and affective theory of mind were measured using a novel, dynamic measure of theory of mind. In the task, participants viewed brief (10–60 s) sequentially ordered clips from Season 1, Episode 4 of the sitcom *The Office*, and responded to questions about each clip. The questions assessed three distinct components of cognitive theory of mind—inferring intentionality, inferring others' beliefs, and detecting deception—and one component of affective theory of mind—understanding emotions. The task was adapted from previous research evaluating social comprehension among individuals with autism (Byrge et al., 2015; also see Halberstadt et al., 2011 and Ruffman et al., 2016 for a similar approach).

There were 51 questions in total on the task: 11 control questions to assess basic comprehension, seven questions related to deception, 11 related to inferring beliefs, 13 related to inferring intentions, and nine related to emotions. The number of trials in each condition is consistent with prior work on aging and theory of mind (e.g., Halberstadt et al., 2011; Maylor et al., 2002; Sullivan & Ruffman, 2004). Participants were given 30 s to read and respond to each question. If they did not respond, that item was considered a "missed response" and not included in the final response. An item analysis found that the number of missed responses did not differ across theory of mind domains ($F(4,49) = 1.71$, $p = .17$).

Response options were either multiple choice or yes/no/don't know selection. For example, an inferring intention question was, "Why is the water cooler near Dwight's desk?" (answer: "Dwight wanted to hear office gossip"). A question measuring belief inference was, "Does Michael think there will be downsizing?" (answer: "yes"). An example of a deception question was, "Why does Pam go downstairs?" (answer: "Pam is trying to fool Dwight"). Questions related to understanding the characters' emotions included, "Is Jim happy to see Pam's fiancé, Roy?" (answer: no). See Supplementary Method for examples of foils. For all questions, a still image was also presented on the screen depicting the face and name of the character(s) referenced in the question and answers. At the conclusion of the task, participants were asked if they had ever seen *The Office*.

To categorize the questions as belonging to the appropriate theory of mind subcomponent, three of the authors (A. C. Krendl, D. P. Kennedy, and K. Hugenberg) evaluated each question on two domains: (a) answer accuracy (to determine that the answer was unequivocally correct) and (b) theory of mind subcategory. Full consensus had to be reached on both domains for the question to be retained. One question (inferring intentions) was removed because consensus could not be reached on answer accuracy. This question was excluded from the analyses, leaving a total of 50 questions.

General Cognitive Function

Memory was assessed using the Logical Memory II from the Wechsler Memory Scale IV (Wechsler, 2009), a widely used measure of verbal episodic memory that captures encoding, storage, and recall. In this task, an experimenter read two passages detailing events about an individual. Standard task administration and scoring were used. Participants completed an immediate and 30-min delayed recall for each passage in which they were instructed to retell the stories with as much detail as possible. Points were given for each detail correctly recalled.

Analytical Approach

For the emotion recognition and theory of mind tasks, performance was determined by calculating each participant's accuracy score. For the DANVA2, this amounted to identifying accuracy (#correct/total) on each affect category (happy, sad, angry, fearful; see Supplementary Table 1 for older adults' mean accuracy on the static portion of the DANVA2). For the theory of mind task, accuracy was calculated for each subcomponent (inferring intentions, inferring beliefs, detecting deception, understanding emotions, and control) using the number of correct answers divided by the total number of questions to which the individual responded (excluding missed responses) for that subcomponent. Logical Memory II was scored as the total number of items freely recalled about both stories in the delayed recall.

The social network variables were calculated in accordance with standard conventions (e.g., Perry et al., 2018).

Network size was a sum of the unique individuals listed in the network. Density was calculated as the proportion of the potential connections that exist between each unique individual in the network, with higher values denoting more densely connected networks. Connections between network members were recoded as 1 (network members who were "sort of" or "very close" to one another) or 0 (network members who were "not very close" or "did not know each other"). Density is actual connections divided by potential connections, where potential connections = $\frac{n(n-1)}{2}$. The diversity of social roles represented in the network was computed by summing the total number of distinct kinds of social relationships present in the network (out of 11 possibilities: spouse, parent, in-law, child, other family, neighbor, friend, acquaintance from work, acquaintance from school, acquaintance from church, and acquaintance from social club). A peripheral tie was defined as anyone in the network to whom the older adult was "not very close." Finally, overall support was defined as the mean number of different types of support (range: 1–5) older adults received from each network member.

Analyses were conducted using linear and logistic regression analyses (as appropriate) with network variables of interest—structure (size, density), range (diversity of social roles, presence of any peripheral ties), and support (type of support)—as the dependent variables (see Table 1), and the general and social cognitive measures entered together as predictors in the same step. With the exception of one female who did not complete the theory of mind task, the full sample (N = 120) completed the Social Network Battery, the DANVA2, the theory of mind task, and the Logical Memory. Because there were no gender effects on any of the network variables examined in the current study (all ps > .21), gender was not considered in any analyses. Age was also not included in the regressions because we did not have specific predictions about age, and thus had not recruited an older adult population that equally sampled across ages to test it.

Results

Older Adults' Social Networks

Overall, older adults had an average of 11.7 individuals in their network (SD = 5.4). Half of the older adults (SD = 0.5) reported having at least one peripheral tie in their network. The diversity of roles performed by the members of the network ranged from 2 to 10 (M = 5.48, SD = 1.60). Individuals in the network each offered, on average, numerous types of support (range: 1–5; M = 3.78, SD = 1.91), with emotional support being more consistently offered than instrumental support. Because density and overall network support were skewed, we transformed each (square root, square, respectively) to ensure normal distributions. See Supplementary Table 2 for ranges, means, and skewness of network variables.

Older Adults' Social and General Cognitive Function

To determine whether older adults showed the expected age-related deficits in social and general cognitive function, a group of 111 undergraduates at Indiana University (ages 18–25 years old; M_{Age} = 19.1, SD = 1.4; 61 female) completed the same emotion recognition, theory of mind, and memory tasks as the older adults with one exception: young adults completed one of the Logical Memory stories, not both. Thus, age differences in memory performance are compared only on that story. A synopsis of the key findings is presented below, but full results are reported in Supplementary Material. All means are provided in Table 2 (see also Supplementary Table 1).

Consistent with prior work (e.g., Krendl & Ambady, 2010; Ruffman et al., 2008), no age differences emerged in

Table 2. Mean Accuracy by Young and Older Adults on the Social Cognitive Battery

		Young adults (N = 111)	Older adults (N = 119)	t-Value
Affective theory of mind	Understanding emotions	0.91 (0.1)	0.8 (0.11)	8.38**
Cognitive theory of mind	Detect deception	0.92 (0.1)	0.76 (0.2)	7.55**
	Infer beliefs	0.94 (0.07)	0.84 (0.13)	7.24**
	Infer intention	0.87 (0.08)	0.82 (0.17)	2.94*
Control	Story comprehension	0.90 (0.09)	0.85 (0.14)	3.59**
Emotion recognition	Happy, dynamic	0.72 (0.21)	0.71 (0.21)	0.38
	Sad, dynamic	0.78 (0.18)	0.66 (0.2)	4.61**
	Angry, dynamic	0.85 (0.15)	0.79 (0.14)	2.98**
	Fear, dynamic	0.75 (0.2)	0.66 (0.21)	3.33**
Social memory	Logical Memory II, Story A	11.47 (4.17)	9.55 (4.58)	3.32**

Notes: Numbers within parenthesis in the table means SD. See Supplementary Material for full statistics.
*p < .05. **p < .005.

Table 3. Correlations Between Older Adults' Performance on All Social Cognitive Measures, $N = 120$

		2	3	4	5	6	7	8	9
Affective theory of mind	1. Understanding emotion	.45**	.46**	.48**	.44**	.25*	.01	.08	.37**
Cognitive theory of mind	2. Detecting deception	—	.60**	.65**	.52**	.22	.16	−.01	.34**
	3. Infer belief		—	.57**	.34**	.18	.02	.06	.30**
	4. Infer intention			—	.54**	.20	.12	.07	.48**
Control	5. Story comprehension				—	.29**	.14	.16	.45**
Emotion recognition	6. Dynamic sadness					—	0.17	.16	.16
	7. Dynamic anger						—	.01	.14
	8. Dynamic fear							—	−.03
General cognition	9. Logical Memory II								—

Notes: Significance levels are reported at Bonferroni-corrected $p < .007$.
$^{*}p < .007$. $^{**}p \leq .001$.

DANVA2 accuracy for happiness (*ts* < 1), but older adults were less accurate than young adults in detecting sadness and fear on both modalities (all *ts* > 2.55), and anger on the dynamic modality only ($t(227) = 3.33$, $p = .001$, 95% CI: 0.04, 0.14). On the novel theory of mind task, young adults outperformed older adults on all subcomponents of the task ($F(1,228) = 64.66$, $p < .001$, $\eta^2_{partial} = .22$). The Age group × Question type interaction ($F(4,912) = 11.62$, $p < .001$, $\eta^2_{partial} = .05$) reflected that age-related deficits were most pronounced on detecting deception ($t(228) = 7.55$, $p < .001$, 95% CI: 0.11, 0.20), and understanding emotions ($t(228) = 8.34$, $p < .001$, 95% CI: 0.09, 0.15; all *ts* > 2.94, *ps* < .005). On the general cognitive task, age deficits emerged for long-term recall (Logical Memory IIA: $M_{YA} = 11.47$, $SD = 4.17$; $M_{OA} = 9.55$, $SD = 4.58$; $t(229) = 3.32$, $p = .001$, 95% CI: 0.78, 3.06, where YA = young adults and OA = older adults). See Supplementary Results for more details.

Network Structure

We conducted two linear regressions to determine whether the general cognitive function or social cognitive function (theory of mind, emotion recognition) would predict variables related to network structure (size, density). We included the four subcomponents of theory of mind (understanding emotions, detecting deception, inferring beliefs, and inferring intentions) in the model, as well as the control questions. For emotion recognition, we included the three negative emotions (anger, sadness, and fear), but excluded happiness because, consistent with a large body of research (see Ruffman et al., 2008), age deficits did not emerge on this domain. We focused on the dynamic channels since these better paralleled the dynamic nature of the theory of mind task; these were also the only channels on which age deficits emerged for all three negative emotions. We verified that the nine predictors met the assumptions of collinearity by evaluating variance inflation factors (VIF) and tolerance between these measures. Results indicated that multicollinearity was not a concern (VIF range: 1.08–2.00, tolerance range: .50–.92). See Table 3 for correlations between social cognitive measures, also Supplementary Table 3 for correlations between the nine predictors and social network variables. Sensitivity analyses in G*Power (Faul et al., 2007) were used to determine detectable effect sizes in the sample. Using a power = .80 and the nine predictors indicated that our sample ($N = 120$) was sufficient to identify small effects ($f^2 = .14$) at $p < .05$.

The linear regression model predicting network size was significant ($F(9,118) = 3.05$, $p = .003$) and accounted for 20.1% of the overall variance. Network size was positively predicted by memory ($\beta = .33$), but none of the social cognitive measures (but see Supplementary Table 4). The model predicting network density was also significant ($F(9,118) = 2.92$, $p = .004$), accounting for 19.4% of the variance. Density was also predicted by memory ($\beta = -.27$), but no social cognitive measures. See Table 4 for complete list of regression statistics.

Network Range

We next examined whether general or social cognitive function predicted network range (diversity of social roles, presence of any peripheral ties). The linear regression predicting diversity of social roles was significant ($F(9,118) = 2.95$, $p = .004$) and accounted for 19.6% of the overall variances. Here, memory ($\beta = .25$) and several social cognitive abilities predicted diversity, specifically inferring intentions ($\beta = .30$) and recognizing angry emotions ($\beta = -.19$). We used a bivariate logistic regression to predict the presence of peripheral ties (0 = none, 1 = at least 1). This regression was also significant ($\chi^2(9) = 16.83$, $p = .05$). Affective theory of mind (understanding emotions) drove this effect ($\beta = 4.63$; see Table 4 for complete list of regression statistics).

Network Function

Finally, we used a linear regression to examine whether general or social cognitive function would detect

Table 4. Results of Linear and Logistic Regression Analyses Predicting Network Structure, Network Range, and Network Function From Social Cognitive Function (N = 118)

		Network structure				Network range				Network function					
		Size		Density		Diversity of social roles		Presence of peripheral ties		Overall network support		Instrumental support		Emotional support	
		R^2 = .20**		R^2 = .19*		R^2 = .19*		R^2 = .13*		R^2 = .14*		R^2 = .13*		R^2 = .10	
		β	t	β	t	β	t	B	SE	β	t	β	t	β	t
Affective theory of mind	Understanding emotion	0.15	1.38	0.03	0.21	0.12	1.14	4.63	2.30*	0.18	1.60	0.15	1.31	0.21†	1.85
Cognitive theory of mind	Detecting deception	−0.06	0.46	−0.10	−0.73	−0.17	1.33	−2.69	1.55	−0.16	−1.15	−0.19	1.42	−0.04	0.33
	Infer belief	−0.13	1.14	−0.06	−0.47	−0.23	1.98*	0.23	2.12	−0.02	−0.10	0.07	0.58	−0.17	1.36
	Infer intention	0.06	0.50	−0.06	−0.39	0.30	2.32**	0.83	1.82	0.04	0.24	−0.05	0.36	0.19	1.35
Control	Story comprehension	0.08	0.72	−0.02	−0.17	0.00	−0.03	−0.53	1.91	0.13	1.07	0.18	1.51	0.02	0.13
Emotion recognition	Dynamic sadness	0.06	0.70	0.03	0.32	−0.03	0.32	1.37	1.08	0.19	1.98*	0.16	1.70	0.12	1.25
	Dynamic anger	−0.04	0.47	−0.15	−1.67	−0.19	2.15*	2.08	1.49	−0.08	−0.85	0.00	0.02	−0.14	1.52
	Dynamic fear	0.07	0.74	0.13	1.37	0.07	0.78	−0.77	1.03	0.09	0.95	0.07	0.81	0.03	0.31
Memory	Logical Memory II	0.33	3.15**	−0.28	−2.64*	0.25	2.39*	0.05	0.03	0.08	0.68	0.10	0.90	−0.06	0.59

Notes: Linear regressions were conducted to predict network structure and function, as well as diversity of social roles; a logistic regression was used to predict the presence of peripheral ties. For network size, higher numbers reflect larger networks. Density refers to how well individuals in the network know each other (higher numbers reflect more dense networks), diversity of social roles refers to the number of types of unique social relationships present in the network (range: 3–10), peripheral ties are coded as 1 (at least one) or 0 (none), and network support refers to the average number of different types of support each individual receives from his or her network members. Density and overall network support are transformed (square root and square, respectively) to correct for skewness.

*$p \le .05$. **$p \le .005$. †p = .06.

network support, notably the overall support (emotional and instrumental) offered by network members. The resulting model was significant ($F(9,118) = 2.02$, $p < .05$) and accounted for 14.3% of the overall variance. Detecting sadness contributed to this effect ($\beta = .19$, $p = .05$). We deconstructed network support into instrumental and emotional support and examined each separately. The model was significant for instrumental support ($F(9,118) = 1.94$, $p = .05$), accounting for 13.8% of the variance. Here, detecting sadness moderately contributed to the model ($\beta = .16$, $p = .093$). The model for emotional support was not significant ($F(9,118) = 1.38$, $p = .20$; see Table 4 for full regression statistics).

Discussion

The current study demonstrated that general cognitive function is related to social network size, whereas social cognitive function is related to network range and function. Specifically, having any peripheral ties in the network is related to better affective theory of mind performance, whereas cognitive theory of mind is related to greater diversity in social roles within the network. Together, these findings demonstrate that although general cognitive function relates to certain aspects of older adults' personal social network, distinct social cognitive functions uniquely relate to social network attributes.

Our finding that general and social cognitive functions related to unique aspects of older adults' social network (e.g., structure, range, function) likely are due to the different demands required for maintaining a large, less-densely connected, but supportive network. General cognitive function predicted having larger and less-dense networks. In both cases, the models accounted for nearly 20% of the overall variance in network structure. Memory may be related specifically to these aspects of network structure because it plays an important role in helping to remember information about the people in one's network. Consistent with this finding, prior work with amnesic patients has found that patients with adult-onset amnesia have smaller social networks (Davidson et al., 2012). Although our results could be attributed to individuals' with poorer memory having less accurate memories for their networks during the interview, a recent study found that the social network interview used in the current study is relatively impervious to memory decline (Roth et al., 2020).

Another possibility is that memory specific to social information may relate to network structure. Consistent with this assertion, social memory plays an important role in predicting children's social development and adaptive skills (Hauck et al., 1998). Although our measure of general memory (Logical Memory II) assessed episodic memory (Wechsler, 2009), it is worth noting that the stories in the task are social. Thus, network structure may relate, at least in part, to social memory, which is another domain of social cognitive function. To explore this possibility, a subset of participants ($N = 89$) completed a social memory task (face memory). Both Logical Memory performance and social memory predicted network size, but only Logical Memory predicted density (see Supplementary Material). Future research should further examine this question.

We found that social cognitive function (theory of mind, detecting sadness) was generally related to network range and function, accounting for 13%–19% of the overall variance. Specifically, we found that maintaining a network with more diverse social relationships was related to better accuracy in inferring intentions (cognitive theory of mind), whereas having a peripheral tie in the network was related to affective theory of mind (understanding emotions). Detecting sadness was related to receiving more types of support. These findings are consistent with prior work emphasizing the importance of theory of mind in successfully navigating social interactions (Bishop-Fitzpatrick et al., 2017; Watson et al., 1999). Affective theory of mind might relate to having peripheral ties in the network because prior work has found that aspects of affective theory of mind, such as detecting sarcasm (Phillips et al., 2015), are impaired in older adults. Such skills may be important in less-frequent social interactions when certain cues, such as understanding emotions or detecting sarcasm, may be less obvious. Our findings that theory of mind, at least in part, predicts network function is consistent with prior work emphasizing the importance of theory of mind in successfully navigating social interactions (Watson et al., 1999).

Despite being highly interrelated, the social cognitive measures related to social network attributes in unique, but sometimes conflicting, ways. Notably, although inferring intentions related to greater diversity of social roles in the network, inferring beliefs and detecting dynamic anger related to less diversity. This finding speaks to the potentially dissociable role of the theory of mind components, as well as emotion recognition, in behavior. Moreover, it suggests that examining subcomponents of theory of mind as dissociable processes may provide unique insights into how these functions relate to older adults' social interactions. Future research should extend this work to examine the subcomponents of affective theory of mind (e.g., faux pas detection, understanding emotions).

There are several key contributions of this work. First, by identifying specific mechanisms (e.g., better memory or ability to infer intentions) that relate to greater social connectedness, we can target potential intervention targets. This could involve, for example, improving theory of mind (e.g., inferring beliefs; e.g., Ozonoff & Miller, 1995) or memory (e.g., Belleville et al., 2006). Second, prior studies examining older adults' social networks have typically used proxy questions to capture older adults' social networks (e.g., English & Carstensen, 2014; Huo et al., 2020; Radecki et al., 2019; Stiller & Dunbar, 2007), which may misrepresent an individual's personal social network (e.g., Burt, 1987). In the current study, we used an interview that provides more comprehensive and accurate measures of social networks (Perry et al., 2018). Finally, the current study introduced a novel theory of mind task that used dynamic stimuli to capture several different aspects of theory of mind. Consistent with prior work, age deficits were observed on this task, with particular impairments in deception detection and understanding emotions, consistent with some prior work (e.g., Bailey & Leon, 2019).

An important limitation of the current study is that we cannot disentangle causality between social cognitive function and social networks. The limited empirical research on this topic suggests that engaging in social interactions improve general cognitive function (Ybarra et al., 2008). However, it remains unknown whether engaging in social interactions improves social cognitive function, or whether having better social cognitive function facilitates social interactions. Future work should integrate longitudinal designs and empirical work to determine directionality of these effects. An additional potential limitation is that the current study does not include a young adult comparison group for the social network attributes. Although this limits our ability to interpret the findings in a life-span framework, our study provides important insights into identifying key social cognitive abilities that may relate to older adults' social network structure, range, and function. Finally, although our results suggest that personal social network characteristics relate to higher social cognitive ability, it is possible that different outcomes (e.g., depression, overall well-being) would relate to variables other than social cognitive function.

Together, these findings suggest that distinct cognitive and social cognitive mechanisms may support disparate aspects of older adults' social networks. One potential implication of this work is that changes in the structure, range, and function of older adults' social networks may provide early insight into related changes in their general or social cognitive function. Alternatively, general or social cognitive function may serve as a potential intervention target for preserving the structure, range, and function of their networks.

Supplementary Material

Supplementary data are available at *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* online.

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Conflict of Interest

None declared.

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