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How Theory of Mind Leads to Positive First Impressions

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A common conjecture is that social success relies on "theory of mind"—the everyday skill of imputing mental states to others. We test the hypothesis that individuals with stronger theory of mind skills and motivation garner more positive first impressions because of how they interact with others. Participants included 334 young adults who were paired with a peer for a first-time meeting. Dyads completed a cooperative Lego-building task, which was videotaped and later coded for behavioral manifestations of theory of mind by independent raters. Theory of mind accuracy and motivation were assessed with validated laboratory tasks and a self-report questionnaire, respectively. First impressions were assessed based on partner's ratings of participant likeability, enjoyment of the interaction, and changes in positive affect. Results of actor–partner interdependence mediation models revealed that the associations between theory of mind and first impressions are indirect and mediated through behaviors. Specifically, participants with stronger theory of mind demonstrated greater cognitive sensitivity and pragmatic conversational skills. However, only cognitive sensitivity subsequently predicted more favorable first impressions. This research shows that social-cognitive skills can affect others' social impressions through their behavioral manifestations.

Public Significance Statement

In a study of 334 young adults who were paired with a peer for a first-time meeting, we found that people who showed greater accuracy and motivation in understanding others' thoughts and emotions—"theory of mind"—engaged in behaviors that were more responsive to peers' thoughts and feelings during a cooperative task. These behavioral manifestations of theory of mind made a difference: Those who showed these behaviors left better first impressions on peers. This research shows that social-cognitive skills that are invisible to others can nevertheless affect others' social impressions through their manifestations in real-life interactions.

Keywords: theory of mind, social cognition, cooperation, social behavior, first impressions

Successfully building social connections is crucial to humans' survival, health, and happiness (e.g., Badcock et al., 2017; Cacioppo et al., 2015). Although social structures such as family and community provide a foundation for social connection, the growth of larger social networks depends on our ability to form relationships with new people. A common conjecture is that this ability, and indeed social success more broadly, has its roots in "theory of mind"—the everyday skill of imputing mental states to better understand and predict behavior (e.g., Malle, 2006; Stiller & Dunbar, 2007). The hypothesized centrality of theory of mind in negotiating the social world is underscored by the substantial research attention the topic has received across disciplines (e.g., social psychology, developmental science, psychiatry, and cognitive neuroscience). Yet, there have been no investigations of whether or how theory of mind might be associated with making new social connections. Here, we provide evidence that theory of mind manifests in social behaviors that in turn predict an interaction partner's first impressions.

There are well-established individual differences in how accurately individuals make theory of mind judgments (e.g., Apperly, 2012) and how motivated they are to use this skill (e.g., Carpenter et al., 2016; Devine & Apperly, 2022). These individual differences are positively associated in cross-sectional studies with several social outcomes, including self-reported social network size, relationship satisfaction, and social competence (e.g., Devine & Apperly, 2022; Dodell-Feder et al., 2015; Lewis et al., 2011). Yet, the specifics of this association are unclear in several ways. First, it is unclear

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whether good theory of mind predicts (i.e., is directionally associated with) greater ability to form social connections. Second, it is unclear whether theory of mind is primarily important in the context of maintaining one's existing social connections, or whether it is also important for making new social connections. Finally, even if theory of mind contributes to making new social connections, it is unclear how a social-cognitive skill that is engaged within one's own mind and assessed in simple, arcane laboratory tasks impacts how one is viewed by another person.

We propose that individuals with strong theory of mind skill and motivation interact with new people in specific ways that make manifest their concern for, and adeptness at understanding, others' mental states. Moreover, we propose that it is these behavioral manifestations of theory of mind that affect whether individuals leave positive first impressions. The most proximal way that theory of mind may manifest is through behaviors that are directly predicated on inferred mental states. Such behaviors have been coined "cognitive sensitivity" because they require an individual to identify and respond to others' internal experiences (Prime et al., 2014). Cognitive sensitivity is typically assessed using impressionistic ratings of brief (i.e., 5 min) video clips of two participants completing a joint task. Ratings describe the extent to which participants exhibit observable behaviors that demonstrate consideration of the knowledge and ability of their partner (Prime et al., 2014). Cognitive sensitivity has been examined exclusively in the developmental psychology literature. In these studies, both parental and sibling cognitive sensitivity are associated with more accurate theory of mind judgments among children (Pauker et al., 2017; Prime et al., 2015, 2016; Wade et al., 2015). Notably, cognitive sensitivity tends to be a trait-like characteristic among adults (Sokolovic et al., 2021) and is positively associated with other positive parenting practices (e.g., affection and encouragement; Schneider et al., 2021), parental intelligence (Sokolovic et al., 2021), and socioeconomic status (Browne et al., 2016; Pauker et al., 2017; Sokolovic et al., 2021). However, it is not yet known whether cognitive sensitivity is related to theory of mind in adults, or whether expressions of cognitive sensitivity can contribute to positive first impressions.

A second, more subtle way that theory of mind skills may manifest is through communicative pragmatics. Broadly speaking, pragmatics refers to the social rules that govern the manner and content of communication (Levinson, 1983). The correct application of these rules is predicated upon being able to make utterances that are maximally relevant and comprehensible given the likely beliefs, intentions, and goals of one's partner (Sperber & Wilson, 2002). Social pragmatics are expressed in conversational skills, which include both manner of speech (e.g., rate and volume of speech and prosodic variation; Wilson & Wharton, 2006) and content of speech (e.g., topic initiation and appropriate use of humor; McNally, 2013). There is strong theoretical support for the claim that theory of mind supports communicative pragmatics (see Sabbagh, 1999; Sperber & Wilson, 1986; Stephenson et al., 2021). Furthermore, there is robust evidence that theory of mind is associated with social pragmatic communication skills among children (see Milligan et al., 2007; Tager-Flusberg, 2003). Taken together, social pragmatics may be an important mechanism that helps to explain how theory of mind leads to success in social encounters.

Given that both cognitive sensitivity and pragmatic conversational skills encompass social skills that are often linked to favorable social outcomes (e.g., Selcuk et al., 2018; Templeton et al., 2022; Wohltjen & Wheatley, 2021), we hypothesized that these observable behaviors could help to explain how theory of mind may impact how one is viewed by another person. We assessed participants' cognitive sensitivity and pragmatic conversational skills in the context of a cooperative Lego-building task (Aguilar et al., 2001), which requires iterative reasoning about others' mental states (Krych-Appelbaum et al., 2007; Moll & Tomasello, 2007). See Figure 1 for a depiction of the conceptual model and study measures. Our main hypothesis that theory of mind leads to positive first impressions via its influence on social-communicative behaviors led to two predictions. The first is that theory of mind skills would be positively associated with cognitive sensitivity and pragmatic conversational skills during the cooperative interaction. The second was that these social-communicative behaviors would be positively associated with the interaction partners' first impression of their fellow dyad member, as indicated by ratings of: (a) likeability, (b) enjoyment of the interaction, and (c) positive affect.

Method

Transparency and Openness

We report how we determined our sample size, all data exclusions, and all measures in the study, and we follow JARS (Kazak, 2018). All deidentified data, syntax, and results from this study are available on the Open Science Framework (OSF) website for this project: https://osf.io/fyj83. Data were analyzed using Mplus Version 8.8 (Muthén & Muthén, 2017). This study's design and its analysis were not preregistered.

Participants

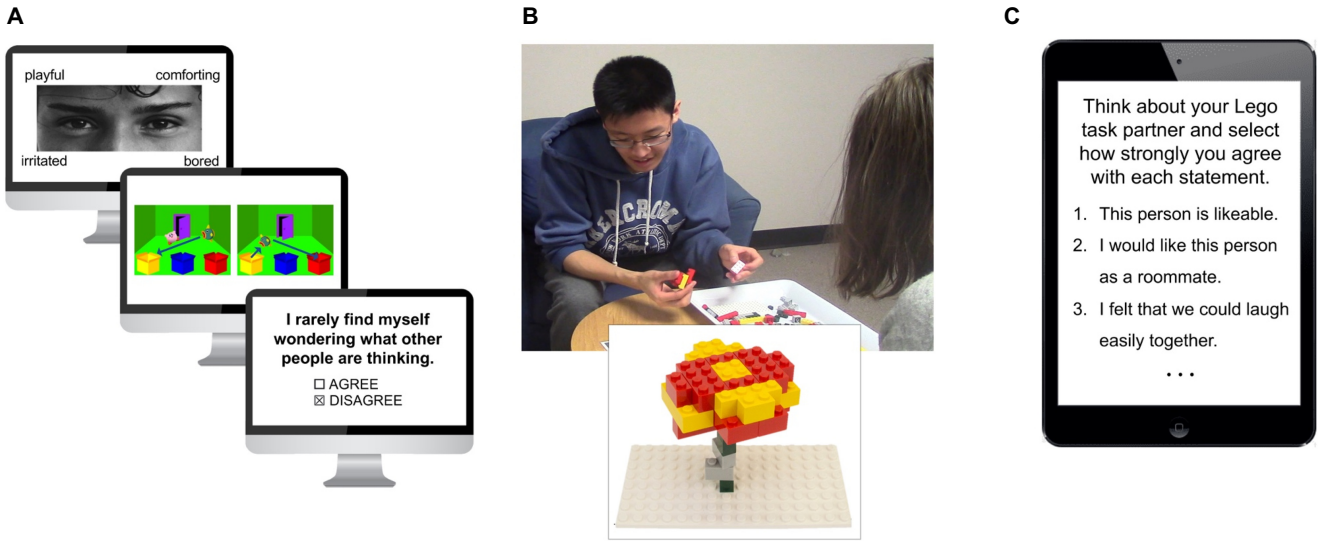
The final sample included 334 participants. Demographic characteristics were collected via participant self-report. Two hundred and forty-eight participants reported that their biological sex was female (74.3%); the remaining 86 (25.7%) reported that their biological sex was male. The average age was 20.25 ($SD = 3.05$, range = 17–49). The majority of participants identified as non-Hispanic White (63.8%), followed by Asian (27.5%), Multiracial (3.3%), Black (3.0%), Hispanic (1.2%), and Indigenous (0.6%). Participants were recruited from first- and second-year psychology courses and from advertisements placed around campus. The initial sample included 398 participants. Of these, 64 were excluded because they were inadvertently paired with a participant who was not a stranger, or their partner did not arrive for the appointment. Several participants had missing data on one or more of the primary measures due to technical difficulties, experimenter error, or participant tardiness. Pairwise deletion was used for missing data.

Measures

Theory of Mind

Reading the Mind in the Eyes Task (RMET; Baron-Cohen et al., 2001). The RMET was presented on a computer screen and included 36 photographs of the eye region of faces surrounded by four mental state adjectives (e.g., cautious, insisting, bored, and aghast). Participants were instructed to choose the adjective that best describes the photograph as quickly as possible. To control

Figure 1
Conceptual Model and Study Measures



Note. (A) Participants independently completed the reading the mind in the eyes test (Baron-Cohen et al., 2001), the false beliefs task (Hudson et al., 2018), and the mind reading motivation scale (Carpenter et al., 2016). (B) Participants were instructed to construct a Lego model in 7 min (Aguilar et al., 2001). Each participant was told that they could each only touch two of the four colors of the Lego pieces to facilitate cooperation. Interactions were video recorded and later coded for behavioral manifestations of theory of mind. (C) Participants independently completed self-report measures of dyad members' likeability, enjoyment in the interaction, and affect. These measures were combined in a composite score as a measure of first impressions. The sample reading the mind in the eyes test image was obtained from the Autism Research Centre Downloadable Tests website (https://www.autismresearchcentre.com/arc_tests). See the online article for the color version of this figure.

for task demands and perceptual processing abilities not attributed to theory of mind in the RMET task, participants also completed the animal task (Harkness et al., 2005). This task includes 12 photographs of animals surrounded by four adjectives in a format similar to the RMET. The RMET and Animals items were presented randomly in one block of 48 items. Accuracy in both tasks was defined as percent correct and response time was recorded in milliseconds.

Adult False Belief (FB) Task (Hudson et al., 2018). Participants viewed 13 videos that each began with two animated characters in a room with three boxes. An animated observer in the room witnesses the two characters enters the boxes. The observer then leaves the room, and the characters move into a new box (FB trials) or remain in the same box (true belief trials). When the observer reenters the room, participants are asked in which box the observer will look for the characters. Accuracy was defined as percent correct and response time was recorded in milliseconds.

Theory of Mind Accuracy Composite. We initially conducted our primary analyses with RMET and FB task accuracy as separate predictor variables. The pattern of results was consistent across RMET and FB tasks. Because we had no a priori hypotheses about the differential effects of RMET and FB task performance and scores were significantly correlated ($r = .15$, $p = .008$), we created a more parsimonious aggregate theory of mind accuracy variable by standardizing performance on both tasks and averaging these scores. Results of analyses using the aggregate variable are presented below for parsimony. Results of the models with RMET and FB accuracy as separate predictors are available on our OSF website.

Mind-Reading Motivation (MRM) Scale (Carpenter et al., 2016). Theory of mind motivation was assessed using the 13-item MRM (e.g., "when I am conversing with more than one person, I like to think about how one person is interpreting what another person says in the conversation"). Each item was rated on a 7-point Likert-type scale (1 = *disagree completed* to 7 = *agree completely*). Total scores ranged from 13 to 91 with higher scores indicating greater theory of mind motivation. Internal reliability for our administration of this scale was acceptably high (Cronbach's $\alpha = .71$, McDonald's $\omega = .71$).

Cooperative Interaction Task and Coding

Participants were asked to build a Lego model based on a photo within a 7-min time frame (Aguilar et al., 2001). To encourage cooperation, each participant was told that they could each only touch two of the four colors of the Lego pieces. Participants were told that if they completed the model within a 7-min time limit, they should start to assemble a second model. The experimenters left the room while the participants completed the building task. The interaction was videotaped and coded offline by raters blind to participants theory of mind scores using the following two measures.

The Cognitive Sensitivity Coding Scheme (Prime et al., 2014). This 11-item measure assessed the extent to which individuals gave explicit evidence of being sensitive to their partners' mental states during the building task. Items were grouped into three broad categories: (a) communicative clarity (six items); (b) mind-reading (three items), and mutuality-building (two items; see Table 1 for items and behavioral exemplars). Ratings were based on validated thin slice methodology (see Prime et al., 2014).

Table 1
Cognitive Sensitivity Items and Behavioral Exemplars

Item	Behavioral exemplar
Communicative clarity	
1. Clear and specific verbal directions	"Put the blue piece beside the yellow piece"
2. Positive nonverbal directions	Pointing to the correct spot
3. Reminds partner about goals/rules	Pointing to the picture or holding it up
4. Tries to complete task in a way that is sensitive to partner's needs	Asking the partner's permission
5. Tries to follow rules in a way that is sensitive to partner's needs	If the partner does not understand, participant is explaining the rules
6. Clear requests for help	Participant communicates in a way partner can understand
Mind-reading	
7. Sensitively responds to partner's requests for help	[Partner cannot find block] "That is a hard one to find, isn't it?"
8. Rephrases when partner does not understand	Sees partner cannot find the small, yellow block and says, "Find the one that has just 4 circles on it"
9. Sensitive to what partner knows/understands	Gives basic and appropriate directions
Mutuality-building	
10. Gives positive reinforcing feedback	"Good work"
11. Promotes turn-taking	"Now you have to do this one next"

Interrater reliability was strong, intraclass correlation coefficient (2, 2) = .80, and internal consistency was excellent (Cronbach's $\alpha = .94$; McDonald's $\omega = .94$). An exploratory factor analysis (EFA) on the cognitive sensitivity coding scheme supported the expected one-factor solution (EFA results are available on our OSF website). As such, item scores were summed to provide a single measure of cognitive sensitivity.

The Conversational Skills Rating Scale (Spitzberg & Adams, 2007). This scale rates 25 features of speech to assess the pragmatic appropriateness of the manner and content of participants' conversational contributions. Each feature was rated on a 5-point Likert-type scale that ranged from 1 = *inadequate* to 5 = *excellent* (see Table 2 for sample items and rating anchors). Ratings were made based on raters' qualitative impression of the participant given the entire recording of the conversation. The interrater reliability for the Conversational Skills Rating Scale was excellent, intraclass correlation coefficient(2, 2) = .94.

An EFA on the Conversational Skills Rating Scale suggested a two-factor solution. Factor 1 contained items that rated the supralinguistic features of speech, including volume of speech, clarity of articulation, speaking rate, and prosodic variation, as well as use of gestures. We labeled this factor "paralinguistic features" as it pertained to the part of communication outside of the words themselves. Factor 2 included items that pertained to effectively managing the conversation, including speaking about oneself, sharing opinions, maintaining topics initiated by one's partner, using humor, smiling, and looking toward one's partner. We labeled this factor "discourse management." Internal reliability of each factor was adequate (Cronbach's $\alpha = .68$, McDonald's $\omega = .70$; Cronbach's $\alpha = .64$, McDonald's $\omega = .65$, respectively).

First Impression Measures

Reysen Likeability Scale (RLS; Reysen, 2005). This 11-item scale assessed the degree to which participants liked their interaction partner (e.g., "I would like to be friends with this person"). Each item was rated on a 7-point scale (1 = *strongly disagree* to 7 = *strongly agree*) and the sum across items was used in analysis. Internal

Table 2
Sample Conversational Skills Rating Scale Items and Behavioral Anchors

Sample item	Scoring anchors
1. Speaking rate	1 = *Speaking pace makes utterances consistently difficult to comprehend, or disruptive to normal response and flow of partner response* to 5 = *Speaking pace is varied compatibly with articulation and vocal variety so as to facilitate partner comprehension and response*
5. Vocal variety	1 = *Speaks in an extremely monotonous manner without variation* to 5 = *Speaks with frequent variation in tonality, but not excessively "cartoon-like" or excessively animated fashion*
6. Volume	1 = *Speaks at extremely quiet/soft or extremely loud level* to 5 = *Consistently speaks at audible, comfortable, and adaptive level*
14. Use of humor	1 = *Continuously serious and humorless, or uses humor that receives overt negative sanction (e.g., frowns, statements of inappropriateness, lack of laughter in response to laugh tokens)* to 5 = *Displays frequent smiles or laughter in response to humorous stimuli, and/or as positive reinforcement to partner*
15. Smiling and laughing	1 = *Displays no smiles or laughter, or displays constant hysterical laughter or constant smirking, regardless of partner stimulus to* 5 = *Displays frequent smiles or laughter in response to humorous stimuli, and/or as positive reinforcement to partner*
21. Expression of personal opinion	1 = *Never gets to express personal opinions, or constantly expresses opinions overly aggressively or passively* to 5 = *Expresses personal opinions with ease and fluency, and with no disruption of partner or negative sanction*

Note. Items and scoring anchors are adapted from *CSRS: The Conversational Skills Rating Scale—An Instructional Assessment of Interpersonal Competence* (pp. 33–40), by B. H. Spitzberg and T. W. Adams, 2007, National Communication Association (https://www.natcom.org/sites/default/files/pages/Basic_Course_and_Gen_Ed_Conversational_Skills_Rating_Scale.pdf). Copyright 2007 by the National Communication Association. Reprinted with permission.

reliability of the RLS in the current study was excellent (Cronbach's $\alpha = .92$, McDonald's $\omega = .91$).

Interpersonal Communication Satisfaction Inventory (ICSI; Hecht, 1978). This scale assessed the extent to which participants enjoyed the time they spent with their interaction partner. We used the 16-item version of this scale but omitted the item "we talked about something I was not interested in" because the confines of the task limited conversation topics. The remaining 15 items were rated on a 7-point scale (1 = *strongly disagree* to 7 = *strongly agree*) and the sum across items was used in analysis. Internal reliability of the ICSI in the current study was very good (Cronbach's $\alpha = .88$, McDonald's $\omega = .88$).

Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). This 20-item scale was used to measure participants' mood states before and after the Lego-building task. Items were rated on a 5-point Likert-type scale (1 = *very slightly or not at all*, 2 = *a little*, 3 = *moderately*, 4 = *quite a bit*, 5 = *extremely*) and were summed across positive (e.g., "excited") and negative (e.g., "upset") items separately. Because positive affect is uniquely relevant for the formation and maintenance of relationships (see Ramsey & Gentzler, 2015 for a review), we focused only on positive items. Internal reliability of the PANAS positive affect subscale was excellent (Cronbach's $\alpha = .90$, McDonald's $\omega = .90$). Change from pre-to-post interaction was quantified using the standardized residuals from the model regressing pretask positive affect onto posttask positive affect.

First Impression Composite. Scores on the RLS, ICSI, and the residualized positive affect score were highly intercorrelated ($rs > .42$, $ps < .001$), thus for purposes of analyses we created an aggregate first impression variable by standardizing and then averaging across the three indices. Results of models with the outcome variables modeled separately are largely consistent with those reported below and are available on our OSF website.

Procedure

This study was approved by the General Research Ethics Board at Queen's University. Participants were scheduled in pairs to participate in a 1-hr study session. Upon arrival to the lab, participants were taken to independent testing rooms to provide written informed consent, and then completed the MRM and PANAS. Participant dyads were then brought together to take part in the cooperative Lego-building task. Following the interaction, participants completed the PANAS, likeability, and satisfaction measures, along with the RMET and FB tasks.

Data Analysis

Power Analysis

In structural equation models, the sample size is determined by power analyses based on the path with the largest number of predictors (Hair et al., 2017). A priori power analysis using G*Power (Faul et al., 2007) indicated that a sample size of 288 is needed to detect a small to medium effect size ($f^2 = 0.05$) with 90% power and 0.05 error probability for a linear multiple regression with three predictors. This effect size was selected based on prior work that suggests the association between theory of mind and social competence is small to medium in magnitude (Devine & Apperly, 2022). We recruited additional participants with the expectation that some may fail to meet inclusion criterion.

Actor–Partner Interdependence Models (APIMs)

Hypotheses were assessed with Kashy and Kenny's (2000) APIM using structural equation modeling. The full model is depicted in Figure 2. In brief, APIMs account for the lack of independence often observed between pairs of individuals by simultaneously estimating intrapersonal (i.e., actor) effects and interpersonal (i.e., partner) effects. In other words, actor effects are represented by the path from each participant's predictor variable to their own outcome. In contrast, partner effects are represented by the path from a participant's predictor variable to their dyad partner's outcome. Theory of mind accuracy composite and theory of mind motivation scores were entered as predictor variables, and the aggregate first impression variable was entered as the outcome. Cognitive sensitivity, paralinguistic features, and discourse management were simultaneously entered as mediator variables. As depicted in Figure 2, each of these variables was modeled simultaneously for each participant in the dyad to estimate both actor and partner effects. Because dyad members were indistinguishable (i.e., there were no a priori differences between the two members of the dyads and we therefore assume that dyad partners do not differ in terms of their influence on outcomes), we constrained effects, means, variances, and covariances to be equal for participants within a dyad. These constraints allowed each participant to be treated as both the actor and partner simultaneously, which simplifies the model and increases power in tests of actor and partner effects. Finally, we examined the models with the inclusion of demographic and task-specific covariates (i.e., animal task accuracy and true belief condition accuracy).

Results

Preliminary Analyses

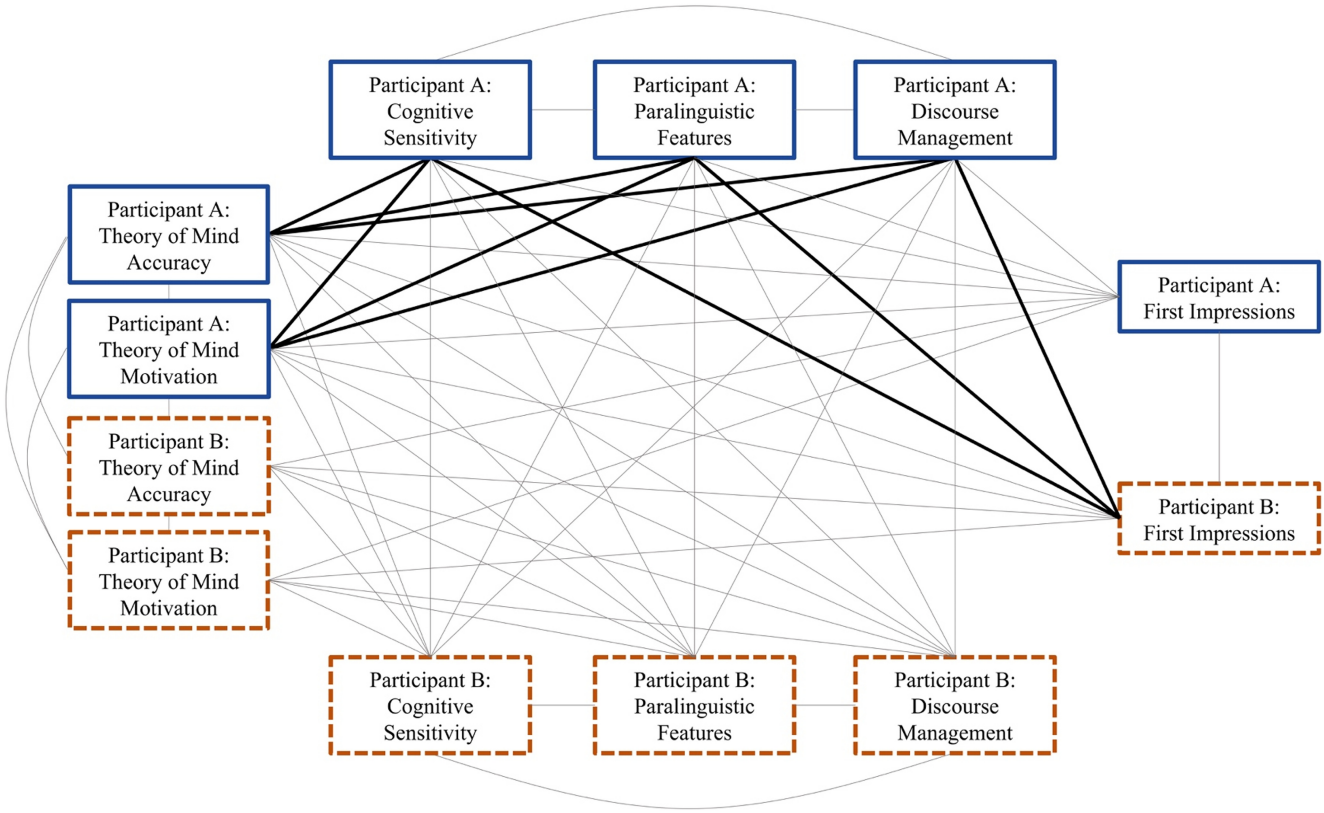
No significant associations emerged between the demographic variables and either theory of mind accuracy or first impressions (all $ps > .09$). However, Asian participants scored significantly lower on theory of mind motivation than non-Hispanic White participants ($Ms = 64.45, 68.45$, $SDs = 9.49, 8.30$), $t(303) = 3.70$, $p < .001$, $d = 0.46$.

Compared to men, women had significantly higher cognitive sensitivity ratings ($Ms = 32.20, 33.90$; $SDs = 5.73, 8.19$), $t(332) = 2.24$, $p = .03$, $d = 0.28$, and discourse management ratings ($Ms = 12.34, 14.05$; $SDs = 4.00, 3.48$), $t(332) = 3.77$, $p < .001$, $d = 0.47$. Age was significantly negatively associated with ratings of discourse management ($r = -.13$, $p = .02$). Furthermore, compared to non-Hispanic White participants, Asian participants had significantly lower cognitive sensitivity ratings ($Ms = 30.70, 34.69$; $SD = 6.88, 5.31$), $t(303) = 5.49$, $p < .001$, $d = 0.68$, and paralinguistic ratings ($Ms = 14.09, 12.42$; $SDs = 3.65, 3.58$), $t(303) = 3.68$, $p < .001$, $d = 0.54$. The pattern of results of the primary models below did not change with the inclusion of these covariates (see our OSF website for these models), thus we present the results from the models without these covariates for the sake of parsimony.

APIM

Results of the full APIM are presented in Tables 3–5. There was no evidence for a direct partner effect between theory of mind accuracy ($\beta = -.05$, $p = .36$) or motivation ($\beta = .05$, $p = .40$) and partner ratings of first impressions. To preview our results, we instead

Figure 2
Full Statistical APIM



Note. Bolded lines represent hypothesized paths. Solid blue boxes are variables measured from Participant A, while dashed orange boxes are variables measured from Participant B. APIM = Actor–Partner Interdependence Model. See the online article for the color version of this figure.

observed indirect effects of theory of mind on dyad partners' first impressions through one behavioral construct: cognitive sensitivity.

Cognitive Sensitivity

As hypothesized, we found evidence for a significant actor effect between theory of mind and cognitive sensitivity; participants who performed more accurately on the theory of mind tasks, and those who self-reported greater theory of mind motivation, were rated as being more cognitively sensitive by third-party raters, $\beta = .32$, $p < .001$ (Figure 3a) and $\beta = .16$, $p = .001$ (Figure 3b), respectively. In turn, we also found evidence for the hypothesized partner effect of cognitive sensitivity on first impression. Here, greater cognitive sensitivity significantly predicted more favorable partner-rated first impressions, $\beta = .27$, $p < .001$ (Figure 4a). Taken together, cognitive sensitivity significantly mediated the associations of both theory

Table 3
Actor and Partner Effects of Theory of Mind on Mediator Variables

	Theory of mind accuracy		Theory of mind motivation	
Mediator variables	β [95% CI]	*p*	β [95% CI]	*p*
Actor effects				
Cognitive sensitivity	.32 [0.22, 0.43]	<.001	.16 [0.06, 0.25]	.001
Paralinguistic features	.26 [0.16, 0.37]	<.001	.10 [−0.01, 0.20]	.07
Discourse management	.01 [−0.09, 0.12]	.86	.18 [0.08, 0.29]	.001
Partner effects				
Cognitive sensitivity	.02 [−0.09, 0.13]	.69	−.01 [−0.11, 0.10]	.93
Paralinguistic features	−.02 [−0.13, 0.10]	.78	−.01 [−0.13, 0.11]	.88
Discourse management	−.08 [−0.18, 0.03]	.16	.06 [−0.04, 0.16]	.22

Note. An actor effect measures the association between a person's score on the predictor to their own score on the outcome. A partner effect measures the association between a person's score on the predictor to their partner's score on the outcome. CI = confidence interval.

Table 4
Actor and Partner Effects of Mediator Variables on First Impressions

	Cognitive sensitivity		Paralinguistic features		Discourse management	
Effects	β [95% CI]	*p*	β [95% CI]	*p*	β [95% CI]	*p*
First impressions						
Actor	.17 [0.04, 0.31]	.01	−.09 [−0.22, 0.04]	.17	.10 [−0.02, 0.23]	.12
Partner	.27 [0.15, 0.39]	<.001	.00 [−0.13, 0.13]	.98	.10 [−0.02, 0.22]	.08

Note. An actor effect measures the association between a person's score on the predictor to their own score on the outcome. A partner effect measures the association between a person's score on the predictor to their partner's score on the outcome. CI = confidence interval.

of mind accuracy (β = .09, *SD* = .03, *p* = .002, 95% CI [0.04, 0.15]), and motivation (β = .04, *SD* = .02, *p* = .01, 95% CI [0.01, 0.08]), with partner ratings of first impressions.

Paralinguistic Features

Partially consistent with hypotheses, we found evidence for a significant actor effect between theory of mind accuracy, but not theory of mind motivation, and paralinguistic features. Participants who performed more accurately on theory of mind tasks were rated as using more frequent paralinguistic features of communication by third-party raters, β = .26, *p* < .001 (Figure 3c). In contrast, theory of mind motivation was not significantly associated with paralinguistic features, β = .10, *p* = .07 (Figure 3d). We did not find evidence for the hypothesized partner effect of paralinguistic features on first impressions, β = .00, *p* = .98 (Figure 4b). Consequently, there was no evidence of a significant indirect effect on partner-rated first impression through paralinguistic features for either theory of mind accuracy or motivation (βs < .001, *p*s ≥ .98).

Discourse Management

Partially consistent with hypotheses, we found evidence for a significant actor effect between theory of mind motivation, but not theory of mind accuracy, and discourse management. Participants who self-reported greater theory of mind motivation were rated as demonstrating greater discourse management by third-party raters, β = .18, *p* = .001 (Figure 3f). In contrast, theory of mind accuracy was not significantly associated with discourse management, β = .01, *p* = .86 (Figure 3e). We did not find evidence for the hypothesized partner effect of discourse management on first impressions, β = .10, *p* = .08 (Figure 4c). Consequently, there was no evidence of a significant indirect effect on partner-rated first impression through discourse management for either theory of mind accuracy or motivation (βs ≤ .01, *p*s ≥ .36).

Discussion

The current study provides novel evidence that individual differences in the accuracy of, and motivation for, theory of mind judgments is manifested in observable behaviors during social interaction that in turn lead to favorable first impressions. As such, these results provide evidence for a mechanism that can, in part, explain how an individual's abstract and invisible social-cognitive skills can affect others' judgments about them. Furthermore, and importantly, given our focus on initial interactions, our results suggest that theory of mind may play an important role in the formation of new relationships, and does not simply reflect the corpus of

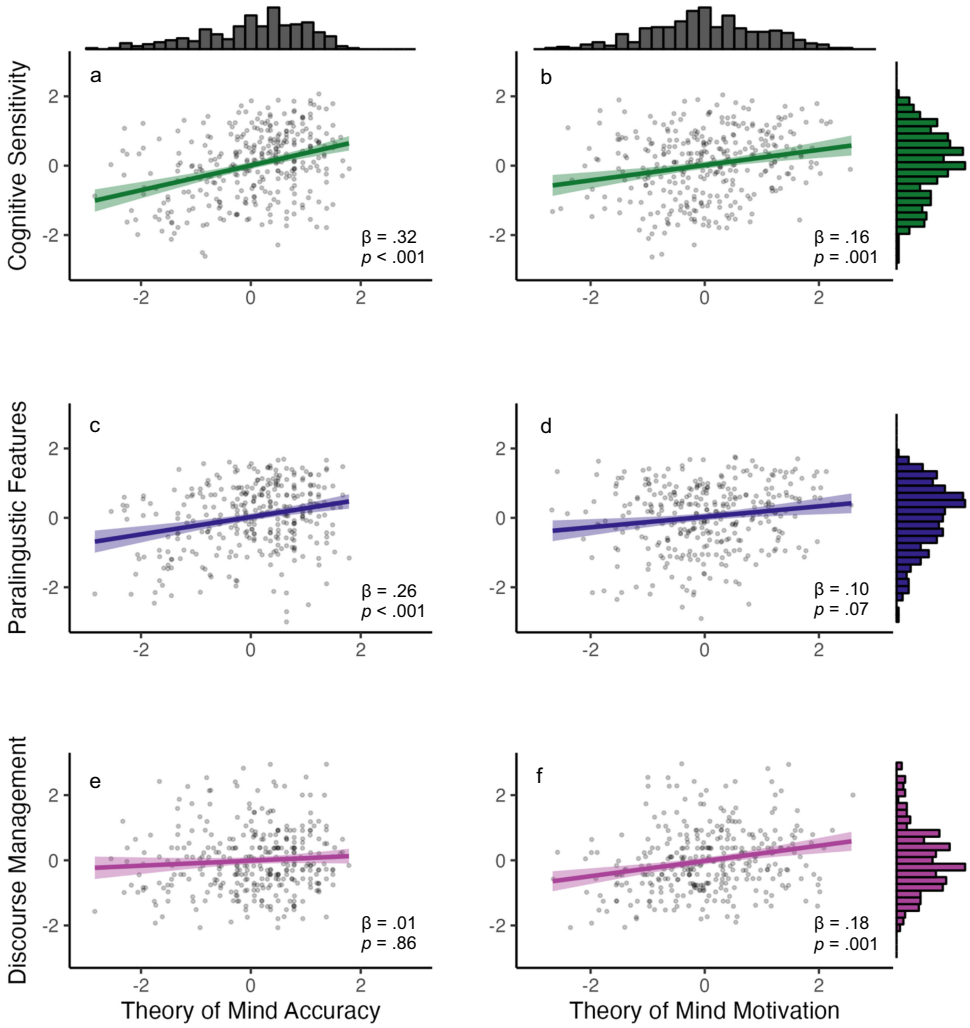
Table 5
Actor and Partner Correlations Among Predictor, Mediator, and Outcome Variables

Predictor variables	Theory of mind accuracy [95% CI]	Theory of mind motivation [95% CI]	
Theory of mind accuracy	.05 [−0.11, 0.21]	−.01 [−0.12, 0.09]	
Theory of mind motivation	.22*** [0.12, 0.31]	.01 [−0.16, 0.16]	
Mediator variables	**Cognitive sensitivity [95% CI]**	**Paralinguistic features [95% CI]**	**Discourse management [95% CI]**
Cognitive sensitivity	.15 [−0.04, 0.31]	.15* [0.02, 0.27]	.13** [0.03, 0.21]
Paralinguistic features	.47*** [0.38, 0.56]	.22** [0.06, 0.35]	.12** [0.03, 0.21]
Discourse management	.13** [0.03, 0.23]	.13* [0.03, 0.23]	.66*** [0.56, 0.74]
Outcome variables	**First impressions [95% CI]**		
First impressions	.04 [−0.17, 0.26]		

Note. Unshaded cells are actor effects (i.e., association between a person's score on one variable with their own score on the other variable). Shaded cells are partner effects (i.e., association between a person's score on one variable with their partner's score on the other variable). CI = confidence interval.
* *p* < .05. ** *p* < .01. *** *p* < .001.

Figure 3

Association of Theory of Mind Accuracy and Motivation With Cognitive Sensitivity (a, b), Paralinguistic Features (c, d), and Discourse Management (e, f)



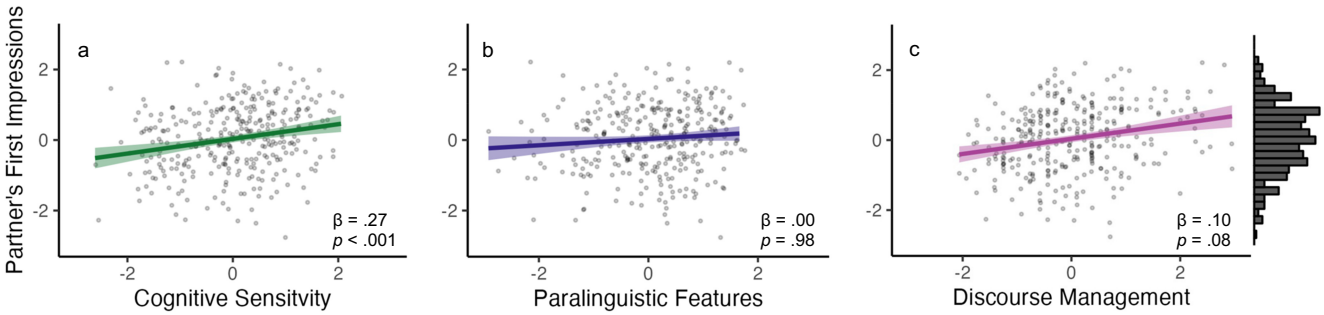
Note. All scores have been standardized and therefore represent values relative to the sample mean. Individual data points are displayed as gray dots; darker dots reflect greater density of data points. The line represents a regression model relating theory of mind accuracy or motivation to each behavior, and the shaded area around the line indicates the 95% confidence intervals. The distribution of theory of mind accuracy and motivation is plotted above the scatterplots, and the distribution of each behavior is plotted to the right of the scatterplots. See the online article for the color version of this figure.

preexisting knowledge, beliefs, and biases about existing social partners.

The strongest evidence in support of our hypothesis that social-communicative behaviors link theory of mind with positive first impressions came from cognitive sensitivity ratings. Specifically, theory of mind accuracy and motivation were each significantly and independently associated with third-party ratings of cognitive sensitivity. In turn, greater cognitive sensitivity was significantly associated with partner ratings of more favorable first impressions. These findings provide direct evidence that cognitive sensitivity is valued in everyday interaction. Expressions of cognitive sensitivity are, at least on their face, conceptually linked with theory of mind skills insofar as they require detecting and sensitively responding to a partner's subtle affective and cognitive cues (e.g., Prime et al., 2014). As such, cognitive sensitivity may represent theory of mind in action. It is noteworthy that it was the behavioral manifestations of cognitive sensitivity that was directly related to partners' first impressions, not individuals' abstract and invisible theory of mind judgments. These findings suggest that interventions aimed at increasing social success may be more successful if they focus on promoting concrete behaviors that comprise cognitive sensitivity rather than on improving abstract social-cognitive performance. For example, mentalization-based therapy focuses specifically on promoting flexibility of thinking about one's own and other's internal mental states, without directly targeting behavior change (Bateman & Fonagy, 2010). In contrast, interpersonal therapy for major depressive disorder (Weissman et al., 2008) and

Figure 4

Association of Cognitive Sensitivity (a), Paralinguistic Features (b), and Discourse Management (c) With Partner's First Impressions



Note. All scores have been standardized and therefore represent values relative to the sample mean. Individual data points are displayed as gray dots; darker dots reflect greater density of data points. The line represents a regression model relating each behavior to partner's first impressions and the shaded area around the line indicates the 95% confidence intervals. The distribution of first impression scores is plotted to the right of the scatterplots. See the online article for the color version of this figure.

social skills training for autism spectrum disorder (e.g., Laugeson et al., 2012) include a focus on behaviors in interpersonal contexts. Our results suggest that treatments may be more beneficial when they emphasize behavioral changes, rather than cognitive changes alone.

Our use of previously unacquainted dyad helped to disambiguate the directional relation between theory of mind and social success in the current encounter. That is, by ensuring that prior social experience between dyad members did not facilitate success in the cooperative building task, this strengthens our conclusion that it was individual differences in theory of mind accuracy and motivation, and the behaviors they engendered, that were the predictors of social success. Nevertheless, it is possible that preexisting, stable traits (e.g., gregariousness) and/or contextual factors (e.g., large number of social connections) could be independently associated with both theory of mind skill and success in this new encounter. Thus, future research that incorporates these additional influences is needed.

In addition, our results highlight the specificity of discrete aspects of theory of mind. Theory of mind accuracy was significantly and positively associated with paralinguistic features, but not discourse management. In direct contrast, theory of mind motivation was significantly and positively associated with discourse management, but not paralinguistic features. These findings suggest that theory of mind accuracy is dissociable from theory of mind motivation, despite being frequently conflated in the literature (Apperly, 2012; Hall & Schwartz, 2019). Clarifying the relation between distinct aspects of theory of mind is crucial to prevent nonreplication and facilitate assessment and prediction of such processes (Happé et al., 2017).

Our results demonstrating a positive association between theory of mind accuracy and paralinguistic features are consistent with research in psycholinguistics indicating that the ability to produce and comprehend appropriate supralinguistic information that clarifies communicative intentions (e.g., prosodic contours and gestures) relates to theory of mind skills across development (see e.g., Chevalier et al., 2011; Pronina et al., 2023; Sabbagh, 1999). Our results extend this research and help to explain how individual differences in abstract social-cognitive skills manifest in daily life. That is, the use of supralinguistic information that helps individuals to communicate in a clear, unambiguous manner requires consideration of the various ways in which our words may be understood by another person.

Mind-reading motivation was uniquely associated with the ability to effectively manage the interaction during the cooperative task. One speculative explanation for this association is that discourse management may be a means through which theory of mind motivation is expressed by facilitating a window into others' internal world. Many of the behaviors that comprise discourse management are other-oriented (e.g., starting a conversation, looking toward another person) and may provide an opportunity to learn about others' mental states. It is noteworthy that this desire may be motivated by inherent curiosity about others' mental states or an explicit goal (e.g., successfully completing the cooperation task). In contrast, it is also possible that the association between theory of mind motivation and discourse management may be driven by a confound variable: a desire to connect with others generally. An important next step for future research is to examine the specificity of theory of mind motivation in predicting these behavioral manifestations and the role of intrinsic versus extrinsic motivation.

In contrast to hypotheses, neither paralinguistic features nor discourse management predicted first impressions. Thus, behaviors indicating cognitive sensitivity may be uniquely associated with first impressions during a cooperative task and, as such, represent an important target for occupational or clinical interventions that seek to improve social functioning in cooperative contexts. We speculate that the variance in first impressions accounted for by paralinguistic features is not unique and may be better accounted for by cognitive sensitivity, given the moderate correlation between these constructs ($r = .47$). Furthermore, several behaviors that reflect high discourse management (e.g., making jokes, starting conversations) may have detracted from the cooperative task, thus potentially weakening the positive association between this construct and partners' first impressions. An important goal for future research is to investigate whether discourse management mediates the association between theory of mind and positive first impressions during interactions that do not rely on cooperation.

Constraints on Generality

The current results should be interpreted considering the following limitations. First, the study sample comprised undergraduate volunteers from a suburban Canadian university and, thus, results

require replication with more diverse samples. Second, this was not an experimental design, which limits our ability to draw causal conclusions. However, the use of stranger dyads, and the temporal separation of behaviors and partner-rated first impressions, provides preliminary evidence of a causal association. Third, while we coded spontaneous behaviors in an unscripted interaction, this was nevertheless a relatively contrived laboratory situation. Therefore, it will be important to determine whether the models supported here extend to the formation of relationships in real-world contexts. Finally, it was beyond the scope of the current investigation to determine why particular social-communicative behaviors were associated with positive partner ratings. We suspect that people make positive trait inferences about those who demonstrate cognitive sensitivity and pragmatic conversational skills. Future research is needed to examine what these trait inferences might be, and whether they further mediate the associations among theory of mind skills, social-communicative behaviors, and positive social outcomes.

Conclusion

In summary, individual differences in theory of mind have implications for the formation of social connections because of the ways in which these individual differences manifest in communicative discourse. Specifically, theory of mind accuracy and motivation were positively associated with behaviors that demonstrate cognitive sensitivity, which in turn predicted an interaction partner's positive first impressions. Thus, although theory of mind plays a critical role in expanding social networks, its role is an indirect one; the specific role for theory of mind is that it makes possible particular kinds of social behaviors that people appear to value. These results provide insight into what might lead one to form positive impressions of a new social partner, which is a critical step in creating, maintaining, and growing critical social networks.

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