

Linking Vocabulary Knowledge with Theory of Mind and Online Social Reasoning in Adults

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1. Introduction

From infancy and throughout life, humans are deeply interested and invested in other people and what they are doing, thinking, feeling, and saying (Lieberman, 2013). Our capacity to make sense of others depends on having a theory of mind, i.e., an ability to represent people's knowledge, beliefs, desires, emotions, and intentions, and recognize how such mental states differ across individuals and change over time (Wellman et al., 2001). Theory of mind emerges in infancy and develops in tandem with language abilities (Astington & Jenkins, 1999; de Villiers & de Villiers, 2014). Children with stronger language skills perform better on tasks measuring belief attribution, false-belief understanding, perspective-taking, and social-emotional knowledge (Kim et al., 2019; Milligan et al., 2007). Such findings have led to the view that language provides crucial representational resources for conceptualizing and reasoning about mental states (Astington & Baird, 2005).

With regard to children's initial understanding of false belief, representational change, and other key components of theory of mind, researchers have emphasized how the acquisition of specific linguistic constructions support children's grasp of invisible mental states by rendering them objects of contemplation. Structurally, a key linguistic milestone is the ability to produce and understand embedded clauses, in which one proposition is nested within another. These constructions allow children to represent beliefs explicitly to distinguish what someone thinks from what they know to be true (de Villiers & de Villiers, 2014). Other social and contextual accounts of early theory of mind development emphasize the child's participation in a community of minds, where everyday discourse and reminiscing about people supports their grasp of intentions, beliefs, motivations, and the like (Nelson et al., 2003), effectively teaching them how to talk about the mind (Bartsch & Wellman, 1995). Moving beyond early childhood, researchers have proposed that reading comprehension and theory of mind mutually reinforce each other in allowing people to think recursively about mental states, e.g., what I want you to think

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about what I believe (Goa et al., 2026). The relation between reading and theory of mind is stronger for fiction than expository text, presumably because tracking fictional characters' attitudes, intentions, emotions, beliefs, and knowledge requires advanced perspective-taking and mental-state reasoning skills (Dore et al., 2018; Kidd & Castano, 2013). While most of the foundational research on language and theory of mind has been conducted with children and adolescents, we would expect language to play a similar role in supporting mental-state reasoning over the lifespan (Apperly et al., 2009; Kidd & Castano, 2013). Adults think about other people by default, regardless of whether they are engaging in face-to-face interactions or communicating via online social platforms (Lieberman, 2013; Sparrow & Chapman, 2013). Given that people must rely on limited information and perceptual cues when communicating online, we would expect language and theory of mind to facilitate their ability to make social inferences while navigating online social networks.

To date, only a handful of studies have examined how language and theory of mind may support online social reasoning. These studies have focused on source evaluation, i.e., how we determine whether online content and information sources can be trusted, including college students' use of lateral reading as a media literacy strategy. Lateral reading involves leaving a website or social media post to search for information about the people and organizations posting the content. College students who scored higher on vocabulary knowledge (Brodsky et al., 2020) or reading comprehension (Brodsky, Brooks et al., 2021) were more likely to use lateral reading to vet online information and sources than their peers who scored lower on the language assessments. In parallel, Dyoniziak et al. (2023, 2025) found that teenagers who scored higher on advanced theory of mind tasks were also more successful in evaluating the trustworthiness of online content and in determining whether the information source was benevolent or exploitative.

The present study extends this line of work by focusing on two additional aspects of online social reasoning and engagement: online privacy knowledge and parasocial relationships. Use of digital media is associated with both risks and opportunities (Livingstone & Helsper, 2010), requiring users to consider how their online activity is tracked and their personal information collected, shared, and used (Park, 2013; Purington Drake et al., 2023). Given that online privacy knowledge is a key domain of online social reasoning, we would expect both language ability and theory of mind to be positively associated with online privacy awareness. On the side of opportunities, the internet provides myriad websites and tools for connecting with peers as well as strangers, including celebrities and influencers. Here we focus on parasocial relationships, defined as one-sided experiences of intimacy and personal connection with media figures. Observed initially in television and radio contexts (Calvert, 2021; Horton & Wohl, 1956), these relationships have expanded in digital environments where media figures actively curate their personas and audiences form imagined connections with them through often one-sided online engagement.

Navigating online parasocial relationships requires one to distinguish between appearance and reality—a media figure’s presented image and their authentic intentions—and thus is likely to be tied to social-cognitive skills (Chung & Cho, 2017; Dyoniziak et al., 2025). That said, there is considerable debate about the nature of this relation (Tukachinsky et al., 2025). On the one hand, individuals with stronger motivations for social companionship and affiliation may be more likely to form parasocial attachments, especially with media figures who represent their interests and beliefs (Hartmann, 2016). This would suggest that the same mentalizing abilities that draw individuals into fantasy and fiction are also at play in fostering parasocial relationships. Alternatively, parasocial engagement might serve as a compensatory response for people with difficulties forming real-life social relationships (Tsao, 1996), or with an anxious attachment style (Tukachinsky et al., 2025). Given the lack of consensus, for the present study we asked adults about the intensity of their parasocial relationships and examined relations with language and theory of mind without having a specific hypothesis about their association.

1.1. Research Aims

Our first aim was to examine the strength of association between language and theory of mind in adults. We selected a standardized test of receptive vocabulary knowledge (the Peabody Picture Vocabulary Test; Dunn & Dunn, 2007) to serve as a generic test of language ability, and examined vocabulary scores in relation to theory of mind. For the latter, we selected a fully nonverbal task (Attributions of Intentions; Brunet et al., 2003) to minimize the confound between language comprehension and mental-state reasoning. Given robust links between language and theory of mind in childhood (Kim et al., 2019; Milligan et al., 2007), we expected this association to persist into adulthood.

Our second aim was to examine whether language ability and theory of mind have unique associations with online social reasoning. For this aim, we focused on two aspects: online privacy knowledge and parasocial relationship intensity. Based on research linking individual differences in media literacy with language ability and theory of mind (Brodsky, Barshaba et al., 2020; Brodsky, Brooks et al., 2021; Dyoniziak et al., 2023, 2025), we expected online privacy knowledge and recognition of digital risks to be associated with scores on the language and theory of mind assessments. Given the debate on whether online parasocial interactions serve as an extension vs. a substitution for social relationships (Tukachinsky et al., 2020), we treated potential associations between vocabulary, theory of mind, and parasocial relationships as exploratory.

2. Method

2.1. Participants

College students ($N = 85$; M age = 20.0 years, $SD = 2.7$ years, $Range = 18$ –30 years) were recruited through a Psychology department subject pool at a

nonselective minority-serving public college in the Northeastern United States. The study was approved by the university's Institutional Review Board and advertised on the SONA research participation system. Students were compensated with research participation credits for taking part in the study.

After providing informed consent, participants completed a demographic questionnaire as part of a larger study on college students' social media habits and perceptions of the Internet. Table 1 provides a summary of the demographic characteristics of the sample. All participants reported native or near-native proficiency in English. Note that the race/ethnicity question asked students to check all that apply.

Table 1. Demographic characteristics of the college student sample ($N = 85$)

Characteristic	<i>n</i> (%)
Gender Identity (mutually exclusive)	
Female	52 (61.2%)
Male	32 (37.6%)
Non-binary	1 (1.2%)
Race/Ethnicity (non-mutually exclusive)	
White	27 (31.8%)
Latinx/Hispanic	26 (30.6%)
Black/African American	15 (17.6%)
Asian/Asian American	14 (16.5%)
Middle Eastern/North African	6 (7.1%)
Unknown/Prefer not to disclose	1 (1.2%)
Native Language	
English	63 (74.1%)
Spanish	9 (10.6%)
Other	13 (15.3%)
First Generation Status	
Neither parent attended college	43 (50.6%)
One or both parents attended college	42 (49.4%)

2.2. Materials

Each task was programmed and presented via the Qualtrics survey platform, which participants accessed online from a desktop computer in a psychology laboratory. Other measures from the larger study, including a drawing task (Brodsky, Lodhi et al., 2021), are not included in this report.

2.2.1. Attribution of Intentions Task

The Attribution of Intentions Task (Brunet et al., 2003; Sarfati et al., 1997) was administered as a nonverbal measure of theory of mind suitable for adult respondents. Participants were presented with a set of illustrated sequences depicting goal-directed situations (18 trials in total; see Figure 1 for an example item). Each sequence unfolded across three comic strip panels and was followed by three possible visual outcomes. Participants were asked to choose the outcome that best reflected the character's intentions by clicking on the corresponding panel. Correct responses ranged from 8 to 18 ($M = 15.5$, $SD = 2.6$; Cronbach's $\alpha = .73$).

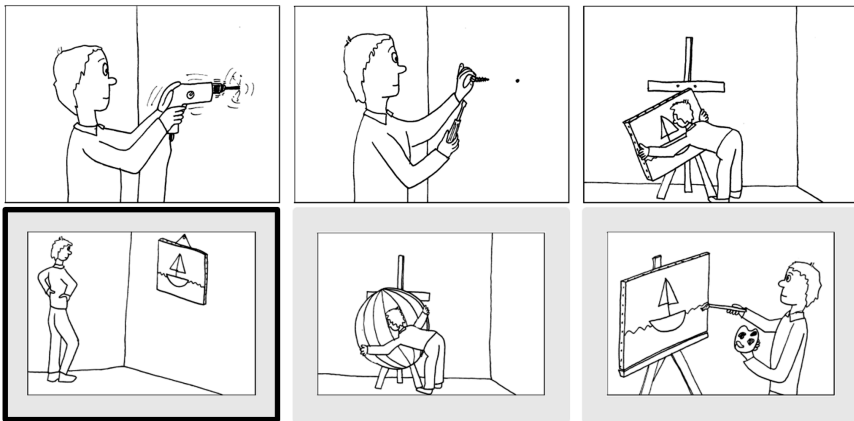


Figure 1. Example trial of the Attribution of Intentions Task (printed with permission from Brunet et al., 2003)

2.2.2. Peabody Picture Vocabulary Test

To assess receptive vocabulary knowledge, we administered a computerized adaptation of the Peabody Picture Vocabulary Test Version 4 (Form B; Dunn & Dunn, 2007) on Qualtrics. Participants were presented with four images displayed in a square. A “Play Audio” button allowed them to hear a recording of the target word, which they could replay once. Participants were instructed to select the image that matched the word they heard by clicking on it. Items were presented in sets of 12 items, with difficulty increasing over consecutive sets (maximum = 84 items). The computerized version began at set 13, which is the recommended starting point for 17- to 18-year-olds. Participants were required to answer at least 5 items correctly to advance to the next set. The test ended when the participant failed to meet this threshold. The number of items administered ranged from a minimum of 12 (1 set) to a maximum of 84 (7 sets). Correct responses ranged from 3 to 75 words ($M = 44.0$, $SD = 15.5$).

2.2.3. Youth Social Media Literacy Inventory: Online Privacy Subtest

We assessed participants' online social reasoning using the Online Privacy Subtest of the Youth Social Media Literacy Inventory (YSMLI; Purington Drake et al., 2023). The YSMLI is a 90-item validated test bank covering factual and critical knowledge of social media and digital citizenship across six subtests. The Online Privacy Subtest consisted of 15 questions related to shaping a positive digital footprint and managing privacy. Items were a combination of true or false questions (4 questions), short multiple-choice questions (5 questions), and vignettes with multiple-choice response options (6 questions). Table 2 presents the full set of true-false and short multiple-choice questions. With regard to the vignettes, an example item is *You met a girl called Jane on Snapchat. You have never met her in real life. It is fun to talk to her and she is now asking where you live. What information should you definitely not share?* For this item, participants were asked to select from the following answer choices: *how are you currently feeling; whether you like her or not; which color you like the most; your home address; or I don't know.*

Table 2. Representative Sample Items from YSMI Online Privacy Subtest

Item	Format
Social media websites like Facebook can see and save what you post online.	TF
A digital footprint is all the information about a person that can be found on the internet.	TF
Before posting something, it is always good to think about who might see it. That way, you can stop yourself from sharing too much.	TF
Social media websites like Facebook can see and save what you post online.	TF
Why can it be a problem to share something personal on social media?	MC
Which sentence is true about your digital footprint?	MC
You took a picture of your friend spilling chocolate milk on his shirt. What should you do?	MC
What can you do to make a positive digital footprint?	MC
Which activity makes up a digital footprint?	MC

Note. TF stands for True or False answer choices. MC stands for multiple choice (short prompts).

Items were scored as correct or incorrect, and tallied to calculate the percentage correct ($M = 84.2\%$, $SD = 11.5\%$, $Range = 46.7\text{--}100\%$, $\alpha = 0.54$, $\omega = 0.54$). Across all items, participants were given the option to respond *I don't know*. When this option was selected, the question was scored as incorrect.

2.2.4. Parasocial Relationship Intensity Scale

We assessed the strength and intensity of participants’ parasocial bonds with a media figure using a 12-item Likert scale. Six items on affective parasocial connection were drawn from the original Parasocial Interaction Scale (Rubin et al., 1985). Two of the four items on imagined friendships and social fit were taken from Rosaen and Dibble’s (2008) adaptation of the Parasocial Interaction Scale, and two were adapted from McCroskey and McCain (1974). We created two additional items to assess reliance on the media figure for consequential life choices. At the start of the task, participants identified their favorite celebrity or influencer and then responded to a series of items about that individual; see Table 3. Higher numbers indicate higher parasocial relationship intensity ($M = 3.6$, $SD = 0.6$, $Range = 2–5$, $\alpha = 0.85$).

Table 3. Item-level information for Parasocial Relationship Intensity Scale

Item	<i>M</i>	<i>SD</i>	α if
			<i>SD</i> removed
1. If I could, I would like to meet X in person	4.2	1.0	0.51
2. I feel sorry for X when they make a mistake	3.3	1.0	0.54
3. If something happened to X, I would feel bad	4.0	0.8	0.44
4. X would fit in well with my group of friends	3.3	1.1	0.37
5. I see X as a natural, down-to-earth person	4.1	0.9	0.48
6. X makes me feel comfortable, like I’m with a friend	3.6	1.1	0.74
7. If X appeared on a show, I would want to watch it	4.3	0.7	0.24
8. X is the kind of person I would like to play or hang out with	3.8	1.0	0.69
9. If X lived in my neighborhood, we would be friends	3.6	1.1	0.60
10. I would trust X to help me find a well-paying job	3.3	1.3	0.49
11. I would trust X to manage my money.	2.7	1.3	0.48
12. X seems to understand the kinds of things I want to know	3.4	1.1	0.60

Note: Items were 5-point Likert scale items. 1 = Strongly disagree, 5 = Strongly agree. X was replaced by the media personality they provided in the survey.

2.4. Design and Procedure

The study utilized a within-subjects correlational design. Participants completed the tasks in a single session conducted in person. A trained research assistant was present throughout the session to answer questions and monitor engagement. The measures were presented in a fixed order: Online Privacy

Subtest, Parasocial Relationship Intensity Scale, Attribution of Intentions Task, and Peabody Picture Vocabulary Test.

3. Results

3.1. Preliminary Correlational Analyses

As a first step in exploring relations between theory of mind, vocabulary knowledge, and online social reasoning, we examined zero-order correlations between the variables (see Table 4; Bonferroni corrected $\alpha = .008$). Scores on the Attribution of Intentions Task correlated significantly and positively with Peabody Picture Vocabulary Test scores and the Online Privacy Subtest. Scores on these three tasks had negative associations with scores on the parasocial relationship intensity scale, though none were statistically significant after applying the Bonferroni correction. Note that for the parasocial relationship intensity, higher scores indicated greater investment in parasocial relationships, which tended to be associated with participants exhibiting lower scores on the theory of mind and vocabulary knowledge assessments.

Table 4. Zero-order correlations across measures ($N = 85$)

Measure	AIT	PPVT	OPS	PRI
Attribution of Intentions Task	—	.54	.33	-.23
Peabody Picture Vocabulary Test	< .001	—	.22	-.27
Online Privacy Subtest	.002	.040	—	-.10
Parasocial Relationship Intensity	.034	.013	.348	—

Note. Upper triangle shows Pearson correlation coefficients. The lower triangle shows p -values. Bonferroni-corrected significance threshold was $\alpha = .008$. AIT = Attribution of Intentions Task, PPVT = Peabody Picture Vocabulary Test, OPS = Online Privacy Subtest, PRI = Parasocial Relationship Intensity Scale

3.2. Structural Equation Model

We applied structural equation modeling to examine relations between variables within a single structural model, using the *lavaan* package in R (Rosseel, 2012). To preserve our degrees of freedom, we treated the Parasocial Relationship Intensity Scale as a latent variable, using individual Likert-scale items as indicators. To ensure the validity of the full scale as a latent variable, we conducted a single-factor confirmatory factor analysis. Several Likert-scale items significantly co-varied with each other, reducing model fit. To address this, we allowed several Likert-scale items to freely covary with each other; see Figure 2 with asterisks indicating significant covariances between items. The final model exhibited fit indices within the acceptable range, $\chi^2(38) = 47.73$, $p = .134$; $CFI = .97$; $TLI = .96$; $RMSEA = .06$; $SRMR = .07$.

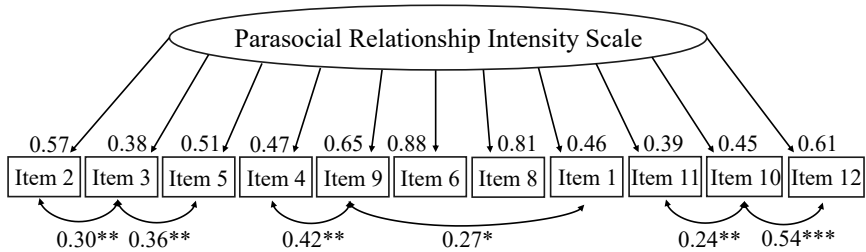


Figure 2. Confirmatory factor analysis for the Parasocial Relationship Intensity Scale

Note. $p < .05$, $p < .01$, $p < .001$

Having established the validity of the latent variable for the Parasocial Relationship Intensity Scale, we fit a structural equation model in which we tested for bidirectional relations between scores on the Peabody Picture Vocabulary Test, Attribution of Intentions Task, Parasocial Relationship Intensity Scale, and Online Privacy Subscale; see Figure 3. This model had fit indicators slightly worse than the previous confirmatory factor analysis, $\chi^2(68) = 103.68$, $p = .003$; $CFI = .91$; $TLI = .88$; $RMSEA = .08$, $SRMR = .08$. Full reporting of the model is presented in Table 5.

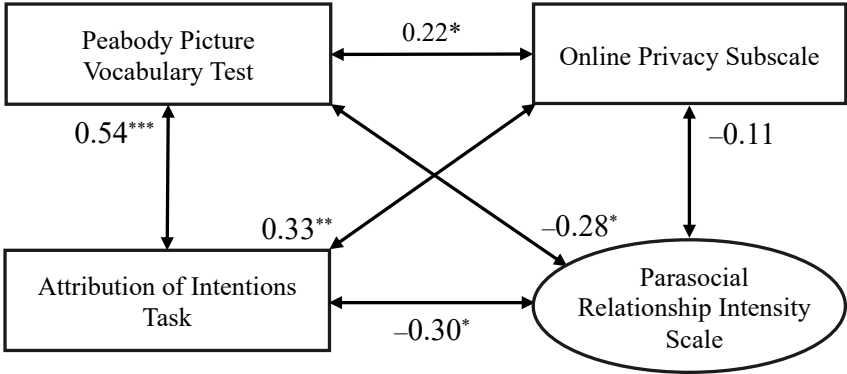


Figure 3. Path model showing associations between scores for the Peabody Picture Vocabulary Test, Attribution of Intentions Task, Online Privacy Subtest, and Parasocial Relationship Intensity Scale.

Note. $p < .05$, $p < .01$, $p < .001$

Table 5. Path Coefficients of the Structural Equation Model

Path	β	SE	<i>p</i>
Attribution of Intentions ↔ Peabody Picture Vocabulary	0.54	0.12	< .001
Online Privacy ↔ Peabody Picture Vocabulary	0.22	0.11	.044
Parasocial Intensity ↔ Peabody Picture Vocabulary	−0.29	0.06	.033
Attribution of Intentions ↔ Parasocial Intensity	−0.30	0.06	.028
Attribution of Intentions ↔ Online Privacy	0.33	0.11	.004
Online Privacy ↔ Parasocial Intensity	−0.11	0.06	.334

In keeping with the results of the bivariate correlational analysis, scores on the Peabody Picture Vocabulary Test and the Attribution of Intentions Task were positively associated ($\beta = .54$, $SE = .12$, $p < .001$), with a medium effect size. In turn, scores on the Peabody Picture Vocabulary Test and Attribution of Intentions Task were each positively associated with the Online Privacy Subscale ($\beta = .22$, $SE = .11$, $p = .044$; $\beta = .33$, $SE = .11$, $p = .004$, respectively), with small effect sizes. In contrast, both the Peabody Picture Vocabulary Test and the Attribution of Intentions task were negatively associated with the Parasocial Relationship Intensity Scale ($\beta = -.29$, $SE = .07$, $p = .026$; $\beta = -.28$, $SE = .07$, $p = .029$, respectively), both small effects. Together, these results suggest that stronger language ability and theory of mind are associated with more advanced online social reasoning and less intense parasocial relationships.

4. Discussion

The present study addressed two central questions about language and theory of mind. We first sought to determine whether language ability and theory of mind remain significantly correlated in adulthood. For this aim, we used a standardized test of receptive vocabulary knowledge (Dunn & Dunn, 2007) as a generic measure of language ability (Krasileva et al., 2017), and a nonverbal comic strip task to minimize verbal demands associated with traditional theory of mind tasks (Brunet et al., 2003; DeNigris et al., 2022). In line with our hypotheses and results from younger populations (Kim et al., 2019; Milligan et al., 2007), we found a medium-sized positive correlation between language ability and theory of mind in college-age adults. This finding aligns with other recent work linking individual differences in language ability with advanced theory of mind in college students (Montgomery et al., 2024). Using factor analysis, Montgomery and colleagues identified three tasks that loaded with receptive vocabulary knowledge: Frith-Happé animation (Abell et al., 2000), strange stories (White et al., 2009), and higher-order false belief (Launey et al., 2015). Each of these tasks has a narrative structure requiring adults to ascribe mental states to predict and explain a character's actions. These tasks also rely heavily on language for comprehending story scenarios and answering test questions.

To our knowledge, we are the first to confirm the positive association between vocabulary knowledge and theory of mind in adults using a fully nonverbal assessment of the latter construct. The Attribution of Intention task was originally designed for testing a clinical population (i.e., adults with schizophrenia (Sarfati et al., 1997), and may be subject to ceiling effects in a college population. In fact, 22.4% of our sample had perfect scores on the measure, and another 25.9% made just one error. As a further limitation, we did not include measures of nonverbal intelligence or executive functioning to serve as covariates. Hence, we could not partial out domain-general cognitive abilities that may correlate with theory of mind and language ability. While our results and those of Montgomery et al. (2024) cannot address the issue of causality, based on prior research with adolescents (Gao et al., 2026), we would expect the relation between language and theory of mind to be bidirectional. Future work should aim to replicate our findings using more challenging theory of mind tasks, controlling for nonverbal ability in analyses, and using research designs better suited for establishing the directionality of effects.

Our second aim was to investigate how language ability and theory of mind might jointly contribute to online social reasoning. Here, we focused on the subdomains of online privacy knowledge and parasocial relationship intensity. In the structural equation model, online privacy knowledge was positively associated with vocabulary knowledge and theory of mind ability. This suggests that adults with weak language and theory of mind skills may be at heightened risk of disclosing private data online and/or may lack awareness of the intentions and motivations of individuals and corporations that benefit from data disclosure and breaches. Conversely, adults with stronger language and theory of mind abilities may be better able to detect persuasive framing, rhetorical cues, and underlying bias in online messaging, and may be more inclined to consider the perspectives of the people and organizations posting provocative content. This would be in keeping with recent work linking individual differences in online source evaluation skills with vocabulary knowledge (Brodsky, Barshaba et al., 2020), reading comprehension (Brodsky, Brooks et al., 2021), and advanced theory of mind (Dyoniziak et al., 2023, 2025).

In contrast to their positive associations with online privacy knowledge, language and theory of mind skills were negatively associated with self-reported intensity of parasocial relationships. That is, adults with weaker vocabulary knowledge and mentalizing abilities reported stronger parasocial attachments to media figures. This finding would seem to align with the suggestion that parasocial interaction may serve as a compensatory mechanism for people who struggle to form and maintain in-person relationships (Taso, 1996) and suggests important differences between online and offline social engagement (Lieberman & Schroeder, 2020). Individuals who struggle with theory of mind may fail to recognize the one-sided nature of their attachments to media figures or grasp that media personalities and influencers are not fully authentic in their interactions with fans. Overreliance on online parasocial relations as a substitute for offline relationships may be of social concern given links between parasocial relationships and loneliness (Liu & Lee, 2024) and problematic behaviors such

as stalking (Fox et al., 2024). Further research is needed to understand how parasocial interaction may enhance or disrupt social relationships, and how effects are influenced by cognitive factors like language and theory of mind.

While online privacy literacy and parasocial relationship intensity may be considered different facets of online social reasoning, the two constructs were only weakly and non-significantly associated in the present study. Whereas online privacy literacy requires understanding specific features and affordances of online platforms and algorithms (Brodsky, Zomberg et al., 2020), parasocial relationship intensity reflects a person's socio-emotional investment in specific media figures (Rosaen & Dibble, 2008). At face value, these constructs appear to be unrelated, yet both draw on language and theory of mind abilities.

5. Conclusion

This study provides new evidence that language and theory of mind are closely associated in adulthood and mutually support online social reasoning. Future research will benefit from updated measures tailored to contemporary digital environments, the inclusion of cognitive covariates, and designs that allow for stronger causal inference. These findings sharpen our understanding of the foundational skills scaffolding discernment in digital social interactions.

References

- Abell, Frances, Happé, Francesca, & Frith, Uta (2000). Do triangles play tricks? Attribution of mental states to animated shapes in normal and abnormal development. *Cognitive Development*, 15(1), 1-16.
- Apperly, Ian A., Samson, Dana, & Humphreys, Glyn. W. (2009). Studies of adults can inform accounts of theory of mind development. *Developmental Psychology*, 45(1), 190–201.
- Astington, Janet W., & Baird, Jodie A. (Eds.). (2005). *Why language matters for theory of mind*. Oxford University Press.
- Astington, Janet W., & Jenkins, Jennifer M. (1999). A longitudinal study of the relation between language and theory-of-mind development. *Developmental Psychology*, 35(5), 1311–1320.
- Bartsch, Karen, & Wellman, Henry M. (1995). *Children talk about the mind*. Oxford University Press.
- Brodsky, Jessica E., Barshaba, Cody N., Lodhi, Arshia K., & Brooks, Patricia J. (2020). Dissociations between college students' media literacy knowledge and fact-checking skills. In *Proceedings of the 2020 Annual Meeting of the American Educational Research Association*.
- Brodsky, Jessica E., Brooks, Patricia J., Scimeca, Donna, Galati, Peter, Todorova, Ralista, & Caulfield, Micheal (2021). Associations between online instruction in lateral reading strategies and fact-checking COVID-19 news among college students. *AERA Open*, Article 23328584211038937.
- Brodsky, Jessica E., Lodhi, Arshia K., Powers, Kasey L., Blumberg, Fran C., & Brooks, Patricia J. (2021). "It's just everywhere now": Middle-school and college students' mental models of the internet. *Human Behavior and Emerging Technologies*, 3(4), 495-511.

- Brodsky, Jessica E., Zomberg, Dvora, Powers, Kasey L., & Brooks, Patricia J. (2020). Assessing and fostering college students' algorithm awareness across online contexts. *Journal of Media Literacy Education*, 12(3), 43-57.
- Brunet, Eric, Sarfati, Yves, Hardy-Baylé, Marie-Christine, & Decety, Jean (2003). Abnormalities of brain function during a nonverbal theory of mind task in schizophrenia. *Neuropsychologia*, 41(12), 1574-1582.
- Calvert, Sandra L. (2021). Intelligent digital beings as children's imaginary social companions. *Journal of Children and Media*, 15(2), 291-296.
- Chung, Siyoung, & Cho, Hichang. (2017). Fostering parasocial relationships with celebrities on social media: Implications for celebrity endorsement. *Psychology & Marketing*, 34(4), 481-495.
- DeNigris, Danielle, Obeid, Rita, & Brooks, Patricia J. (2022). I know what they will do next!": Evaluating contributions of theory of mind to reading comprehension in school-aged children. In *Proceedings of the 46th Annual Boston University Conference on Language Development* (pp. 128-141). Cascadilla Press.
- de Villiers, Jill G., & de Villiers, Peter A. (2014). The role of language in theory of mind development. *Topics in Language Disorders*, 34(4), 313-328.
- Dore, Rebecca A., Amendum, Steven J., Golinkoff, Roberta Michnick, & Hirsh-Pasek, Kathy (2018). Theory of mind: A hidden factor in reading comprehension? *Educational Psychology Review*, 30, 1067-1089.
- Dunn, Lloyd, & Dunn, Douglas M. (2007). Peabody Picture Vocabulary Test, 4th Edition. Pearson.
- Dyoniziak, Yann, Potocki, Anna, & Rouet, Jean-François (2023). Role of advanced theory of mind in teenagers' evaluation of source information. *Discourse Processes*, 60(4-5), 363-377.
- Dyoniziak, Yann, Potocki, Anna, Burnel, Morgane, Macedo-Rouet, Mônica, & Rouet, J. F. (2025). Advanced theory of mind predicts adolescents' evaluation of source benevolence while reading. *Computers in Human Behavior*, 165, 108552.
- Fox, Will, Coupland, Sarah, & Hart, Stephen (2024). Online stalking of Instagram influencers. *Journal of Threat Assessment and Management*, 11(4), 229-247.
- Gao, Qiyang, Xu, Tianyu, Chen, Peiyao, Zhang, Ruru, & Wang, Zhenlin (2026). Reciprocal association between theory of mind and reading comprehension of narrative (but not expository) text in middle childhood: A latent change score approach. *Learning and Individual Differences*, 125, 102823.
- Hartmann, Tilo (2016). Parasocial interaction, parasocial relationships, and well-being. In *The Routledge handbook of media use and well-being: International perspectives on theory and research on positive media effects* (pp. 131-144). Taylor and Francis Ltd.
- Horton, Donald, & Richard Wohl, R. (1956). Mass communication and para-social interaction: Observations on intimacy at a distance. *Psychiatry*, 19(3), 215-229.
- Kidd, David C., & Castano, Emanuele (2013). Reading literary fiction improves theory of mind. *Science*, 342(6156), 377-380.
- Kim, Tae Young., Kang, Jin Kyong, & Kim, Jung A. (2019). A meta-analysis of the relationship between children's language ability and socio-emotional development. *Communication Sciences & Disorders*, 24(2), 274-287.
- Krasileva, Kate E., Sanders, Stephan J., & Hus Bal, Vanessa (2017). Peabody Picture Vocabulary Test: Proxy for verbal IQ in genetic studies of autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 47(4), 1073-1085.
- Launay, Jacques, Pearce, Eiluned, Wlodarski, Rafael, van Duijn, Max, Carney, James, & Dunbar, Robin I. M. (2015). Higher-order mentalising and executive functioning. *Personality and Individual Differences*, 86, 6-14.

- Lieberman, Alicea, & Schroeder, Juliana (2020). Two social lives: How differences between online and offline interaction influence social outcomes. *Current Opinion in Psychology*, 31, 16-21.
- Lieberman, Matthew D. (2013). *Social: Why our brains are wired to connect*. Oxford University Press.
- Liu, Juan, & Lee, Jung-Sook (2024). Social media influencers and followers' loneliness: the mediating roles of parasocial relationship, sense of belonging, and social support. *Online Media and Global Communication*, 3(4), 607-630.
- Livingstone, Sonia, & Helsper, Ellen (2010). Balancing opportunities and risks in teenagers' use of the internet: The role of online skills and internet self-efficacy. *New Media & Society*, 12(2), 309-329.
- McCroskey, James C., & McCain, Thomas A. (1974). The measurement of interpersonal attraction. *Speech Monographs*, 41(3), 261-266.
- Milligan, Karen, Astington, Janet Wilde., & Dack, Lisa Ain (2007). Language and theory of mind: Meta-analysis of the relation between language ability and false-belief understanding. *Child Development*, 78(2), 622-646.
- Montgomery, Derek E., Tompkins, Virginia, & Feng, Xin (2024). The theory of mind construct in adulthood: Perspective taking in relation to language and executive function. *Frontiers in Psychology*, 15, 1435685.
- Nelson, Katherine, Plesa Skwerer, Daniela, Goldman, Sylvie, Henseler, Sarah, Presler, Nechama, & Fried Walkenfeld, F. (2003). Entering a community of minds: An experiential approach to 'theory of mind'. *Human Development*, 46(1), 24-46.
- Park, Yong Jin (2013). Digital literacy and privacy behavior online. *Communication Research*, 40(2), 215-236.
- Purinton Drake, Amanda, Masur, Phillipp K., Bazarova, Natalie N., Zou, Wenting, & Whitlock, Janis (2023). The youth social media literacy inventory: Development and validation using item response theory in the US. *Journal of Children and Media*, 17(4), 467-487.
- Rosaen, Sarah F., & Dibble, Jayson L. (2008). Investigating the relationships among child's age, parasocial interactions, and the social realism of favorite television characters. *Communication Research Reports*, 25(2), 145-154.
- Rosseel, Yves (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, 48(2), 1-36.
- Rubin, Alan M., Perse, Elizabeth M., & Powell, Robert A. (1985). Loneliness, parasocial interaction, and local television news viewing. *Human Communication Research*, 12(2), 155-180.
- Sarfati, Yves, Hardy-Baylé, Marie-Christine, Besche, Chrystel, & Widlöcher, Daniel (1997). Attribution of intentions to others in people with schizophrenia: A non-verbal exploration with comic strips. *Schizophrenia Research*, 25(3), 199-209.
- Sparrow, Betsy, & Chatman, Ljubica (2013). Social cognition in the internet age: Same as it ever was? *Psychological Inquiry*, 24(4), 273-292.
- Tsao, Jinshi (1996). Compensatory media use: An exploration of two paradigms. *Communication Studies*, 47(1-2), 89-109.
- Tukachinsky, Riva, Walter, Nathan, & Saucier, Camille J. (2020). Antecedents and effects of parasocial relationships: A meta-analysis. *Journal of Communication*, 70(6), 868-894.
- Wellman, Henry M., Cross, Davis, & Watson, Julianne (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development*, 72(3), 655-684.
- White, Sarah, Hill, Elizabeth, Happé, Francesca, & Frith, Uta (2009). Revisiting the strange stories: Revealing mentalizing impairments in autism. *Child Development*, 80(4), 1097-1117.

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