Exposure to media and theory-of-mind development in preschoolers

Raymond A. Mar [a,*], Jennifer L. Tackett [b], Chris Moore [c]

[a] *York University, Department of Psychology, 239 Behavioural Sciences Building, 4700 Keele Street, Toronto, ON, Canada M3J 1P3*
[b] *University of Toronto, Canada*
[c] *Dalhousie University, Canada*

ABSTRACT

Exposure to different forms of narrative media may influence children's development of theory-of-mind. Because engagement with fictional narratives provides one with information about the social world, and possibly draws upon theory-of-mind processes during comprehension, exposure to storybooks, movies, and television may influence theory-of-mind development. We examined 4–6 year-olds' inferred exposure to children's literature, television, and film, using an objective measure that controls for socially desirable responding. Theory-of-mind was assessed using a battery of five tasks. Controlling for age, gender, vocabulary, and parental income, inferred exposure to children's storybooks predicted theory-of-mind abilities. Inferred exposure to children's movies also predicted theory-of-mind development, but inferred exposure to children's television did not.

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1. Introduction

The developmental benefits of reading to one's child from an early age, and with great frequency, have been widely recognized. Language skills are thought to be the primary beneficiary of this practice (e.g., Sénéchal & LeFevre, 2002; cf. Scarborough & Dobrich, 1994). However, improved linguistic com-

* Corresponding author. Tel.: +1 416 736 2100x20769; fax: +1 416 736 5814.
  E-mail address: mar@yorku.ca (R.A. Mar).
  URL: http://www.yorku.ca/mar/ (R.A. Mar).

petence may not be the only advantage that accrues for preschoolers as a result of storybook exposure. Social cognitive development may also benefit.

1.1. Theory-of-mind and children's storybooks

By the age of 4 years, children have begun to develop an understanding of the mental states of others, known as a theory-of-mind (Astington, Harris, & Olson, 1988). This ability is important for social functioning, as it helps children to coordinate relationships with others (Watson, Linkie-Nixon, Wilson, & Capage, 1999). The content of stories certainly seems well-suited to promote the acquisition of theory-of-mind language and perhaps foster the development of this capacity. Cassidy et al. (1998) found that of the books read to preschoolers by a group of parents, over 75% contained some language related to internal states, and a third dealt directly with the concept of false belief (a key component of theory-of-mind). In an in-depth content analysis of 90 books for 3–4 and 5–6 year-olds, Dyer, Shatz, and Wellman (2000) found that the incidence of mental-state references was frequent, occurring once every three sentences or so. Children's stories are social in nature, centering on interactions between individuals who often have competing goals and frequently describe situations in which characters hold diverging beliefs (Peskin & Astington, 2004). Situational irony, for example, occurred in roughly a third of the children's books studied by Dyer et al. (2000).

Empirical research related to this idea, however, has not been extensive and has yielded mixed results. In one study, children exposed to stories embedded with mental-state terms were more likely to spontaneously produce such words, but they exhibited no greater understanding of their meaning (Peskin & Astington, 2004). Another study (Adrian, Clemente, Villanueva, & Rieffe, 2005) reported that parent–child book reading is correlated with theory-of-mind, but this investigation suffers from some notable limitations, including reliance on self-reported reading habits, a single theory-of-mind measure, and lack of control for important mediators such as the child's age, gender, and parental income. Although Astington (1990) has previously argued that the acquisition of theory-of-mind may aid story comprehension (particularly stories that involve mental states), it remains unclear whether exposure to storybooks aids the development of theory-of-mind. The current study examines this question.

1.2. Theory-of-mind and media

A largely neglected issue is whether other forms of narrative aside from storybooks may also be related to theory-of-mind development. Although there has been some theorizing that television could influence the development of theory-of-mind (Feshbach & Feshbach, 1997), little empirical research exists regarding this possibility. Naigles (2000), however, did report an exploratory study in which preschoolers who watched 10 episodes of "Barney and Friends" demonstrated weak comprehension of the distinction between the words "think," "guess," and "know," despite the fact that these particular episodes featured these words. Naigles hypothesized that this show employed these words rather interchangeably, resulting in decreased discrimination among those exposed to these episodes. Whether this finding can be generalized to other television shows, or even other episodes of this show, remains unknown.

The present study aims to extend work in this area by examining whether there exists a relation between various forms of media (children's storybooks, television, and movies) and theory-of-mind development. This relation is examined while taking into account important variables such as age, gender, vocabulary and family income.

2. Method

2.1. Participants

Participants were 55 children (30 female; ages 4-1 to 6-11, $M = 63.7$ months, $SD = 8.3$), and one of their parents (5 fathers; ages 28–50, $M = 39.7$, $SD = 5.2$, with 2 not reporting age). English was spoken in all homes, although other languages were also spoken in 40% of homes. Family income averaged

in the \$115,001 to \$135,000 (Canadian dollars) category, with a range from \$15,000 to ≥\$255,001. Recruitment was performed through a database maintained by the Child Study Centre (University of Toronto, Canada), and through the Institute for Child Study (Toronto, Canada).

2.2. Measures

Measurement of exposure to different media was achieved using recognition tests completed by parents. These measures are based on the Author Recognition Test (ART) developed by Stanovich and West (1989), and they control for socially desirable responding through use of a signal detection approach. Respondents are asked to indicate from a list of names those that they recognize as belonging to an author, but guessing or indiscriminate checking is discouraged by an explicit warning that some of the names are foils. This method provides an indirect measure of a child's exposure to media, since it is completed by the parent and does not directly ask about that child's media habits. The latter approach was not used due to concerns that parents would not provide objective or valid responses. Despite the limitations of the indirect approach, such measures have been shown to form well-validated indications of the degree to which someone is exposed to print materials and tends to be a 'reader' (Stanovich & Cunningham, 1993; West, Stanovich, & Mitchell, 1993). These types of measures also exhibit better predictive validity than self-report and equivalent validity to daily diary approaches (Allen, Cipielewski, & Stanovich, 1992).

2.2.1. Children's Author Checklist–Parent Report (CAC–PR)

The Children's Author Checklist by Sénéchal, LeFevre, Hudson, and Lawson (1996) was updated to include currently popular children's authors. No expository non-fiction authors were included. The final version included 70 authors of children's narrative fiction (e.g., Maurice Sendak, Beatrix Potter) and 32 foils (e.g., Mark Lepper). Sénéchal and her colleagues have found that checklist measures of inferred children's storybook exposure are valid, unbiased, and a better predictor of child vocabulary than self-report measures (Sénéchal & LeFevre, 2002; Sénéchal et al., 1996; Sénéchal, LeFevre, Thomas, & Daley, 1998). Additional validity data come from demonstrations that adults who are exposed to more children's literature score higher on these types of measures than those who have less exposure (Sénéchal et al., 1996; Stainthorp, 1997).

2.2.2. Children's Title Checklist–Parent Report (CTC–PR)

An additional measure of inferred exposure to children's literature was created using titles instead of authors as targets, based on the Children's Title Checklist developed by Sénéchal et al. (1996). This measure was brought up to date, and all targets were children's narrative fiction. This measure included 63 actual titles (e.g., *A Pocket for Corduroy*, *Thomas's Snowsuit*), and 29 foils (e.g., *Terry Toad*)

2.2.3. Children's Film Recognition Test–Parent Report (CFLM–PR)

A film version of the CTC–PR was created using the titles of children's films. New releases were included along with older, classic films. The final measure consisted of 87 films (e.g., *The Wiggles: Yummy Yummy*, *Fantasia*) and 12 foils (e.g., *The Wiggles: Pyjama Party*, *Dragon Tales: School's All Right!*). Note the close similarity for some pairs of targets and foils. It was not enough for parents to know that "The Wiggles" is the name of a series of children's films, but in order to get credit they had to know the exact subtitle as well. Checking all of the "Wiggles" items resulted in also checking foil items.

2.2.4. Children's Television Recognition Test–Parent Report (CTV–PR)

A measure similar to the CFLM–PR was constructed to examine inferred exposure to children's television. The checklist consisted of 68 current television shows for children (e.g., *Kim Possible*, *Yvon of the Yukon*) and 15 foils (e.g., *The Magic Hotpot*).

2.2.5. Theory-of-mind measures

Theory-of-mind development was measured using a scaled set of tasks created by Wellman and Liu (2004). A five-item version (i.e., Diverse Desires, Diverse Belief, Knowledge Access, Contents False-

Table 1
Theory-of-mind battery procedures.

Task	Procedure
Diverse Desires	Children are presented with a toy figure of an adult, and a piece of paper with a cookie and a carrot drawn on it. They are told that the man wants to have a snack, either a carrot or a cookie, and the child is asked which snack he or she would prefer. Whatever the child chooses, the experimenter explains that the man prefers the other snack. The *target question* for the child is what snack the man will choose to have. To pass this task, the child must answer opposite from his or her own desires.
Diverse Belief	The child is introduced to a toy girl who is looking for her cat. A piece of paper illustrates a garage and a set of bushes, and it is explained that the cat could be hiding in either place. The experimenter then asks the child where he or she thinks that the cat is hiding, in either the garage or the bushes. It is then explained that the toy girl thinks the cat is hiding in the place not chosen by the child. The *target question* is where the girl will look for her cat. In order to be scored as correct, the child must answer opposite to his or her own beliefs.
Knowledge Access	Children are presented with a small plastic box and asked what they think is inside. The box is then opened to reveal a small plastic dog. After closing the box, the child is again asked what is inside to ensure that they recall the object. A toy girl is then introduced, and it is explained that she has never seen inside the box. The *target question* is whether the girl knows what is inside the box, and the *memory question* is whether she has seen inside the box. To be scored as correct, the child must answer "No" to both questions.
Contents False-Belief	A Band-Aid box is presented and the child is asked what they think is inside. The box is then opened to reveal small plastic pig, rather than the expected bandages. Once closed, the child is again asked what is inside the box. A toy boy is then introduced, and it is explained that he has never seen inside the box. The *target question* is whether the boy thinks that the box contains Band-Aids or a pig. The *memory question* is whether the boy saw inside the box. In order to pass this task, the child must answer "Band-Aids" to the target question, and "No" to the memory question.
Real—Apparent Emotion	The child is presented with drawings of a happy, neutral, and sad face that the experimenter uses to ensure the child understands each of these emotional expressions. A story is then told by the experimenter, describing how a boy is mocked by an older girl on the playground and how everyone else laughs. The experimenter goes on to explain that the boy didn't want to show how sad the joke made him feel, because the other children would tease him, so he tried to hide his emotions. Two *memory questions* are then asked, regarding the reaction of the other children when the joke was told and what the other children would do if they knew how he felt. The story is re-told until the child can answer these memory questions correctly. Next the experimenter then asks how the boy really felt after everybody laughed (*target-feel question*), and how he looked on his face when everybody laughed (*target-look question*). The happy, sad, and neutral pictures are used to as response items for these questions. In order to be coded as correct, the child's answer to the target-feel question must be more negative than his or her answer to the target-look question.

Belief, and Real—Apparent Emotion) was administered, as recommended by the creators. Briefly, Diverse Desires tests the child's ability to comprehend that other people can have differing desires from one's own regarding the same objects; Diverse Beliefs is similar, but examines differing beliefs about the same object when the truth is not known; Knowledge Access tests comprehension of the fact that others do not necessarily know what one knows; Contents False-Belief examines whether the child can correctly judge another person's false belief by overcoming their own knowledge; and Real—Apparent Emotion tests whether a child understands that a person can feel one way inside, but outwardly display another emotion. Full descriptions of all of these tasks are available in the source article, and we present brief descriptions in Table 1. These tasks are variants of widely used theory-of-mind tasks and validation of the battery has been demonstrated (e.g., infant social attention predicts later performance, Wellman, Phillips, Dunphy-Lelii, & LaLonde, 2004).

2.2.6. Author Recognition Test–Revised (ART)

Parental recognition of adult authors was undertaken in order to establish discriminant validity for our approach, in that scores on this measure should not predict child theory-of-mind

performance, unlike CAC–PR and CTC–PR scores. An updated and revised version of the ART was used in this study (Mar, Oatley, Hirsh, dela Paz, & Peterson, 2006). It includes 50 fiction authors (e.g., Umberto Eco), 50 non-fiction authors (e.g., Malcolm Gladwell) along with 40 foils (e.g., Aimee Dorr).

2.2.7. Peabody Picture Vocabulary Test-III (PPVT-III; Dunn & Dunn, 1997)

Vocabulary was measured and included as a covariate in all analyses to rule out the possibility that improvements in theory-of-mind are simply due to linguistic competence, an important inclusion considering the known association between language and theory-of-mind development (Astington & Jenkins, 1999; Pyers & Senghas, 2009). By controlling for vocabulary, we can examine the specific predictive ability of inferred media exposure on theory-of-mind, above and beyond its influence on more general abilities such as language development. The widely used PPVT-III (Dunn & Dunn, 1997), a measure of receptive language, was administered. This measure requires children to indicate which picture corresponds to a target word spoken by the experimenter.

2.3. Procedure

Following a short play session designed to make the child comfortable with the testing situation and experimenter, the tasks in the experiment were described and consent solicited from both parent and child. Parents completed the set of questionnaires (i.e., the ART, CAC–PR, CTC–PR, CFLM–PR, and CTV–PR) while the child completed the theory-of-mind battery and the PPVT-III. Following completion of the tasks, children were given a small toy and a certificate of appreciation. Parents and children were then fully debriefed, and a small monetary remuneration provided to the parent.

3. Results

3.1. Scale reliabilities and scores

For recognition measures, false positives (the checking of foils) were subtracted from correct hits to create adjusted scores. The internal reliabilities (Cronbach's alpha) of the recognition measures for child media were all high, CAC–PR: $\alpha = .92$, $M = 12.5$, $SD = 8.1$; CTC–PR: $\alpha = .87$, $M = 16.9$, $SD = 7.2$; CFLM–PR: $\alpha = .87$, $M = 20.5$, $SD = 7.2$; CTV–PR: $\alpha = .92$, $M = 21.0$, $SD = 7.6$. A composite variable for inferred children's storybook exposure (CBOOK) was created by averaging scores on the CAC–PR and CTC–PR, which were highly correlated ($r = .81$, $p < .05$). Similarly, a composite variable was created for inferred exposure to adult books (ABOOK), by taking the average of the fiction and non-fiction sub-scales ($r = .67$, $p < .05$). The number of theory-of-mind tasks passed by each child was summed to create an aggregate theory-of-mind score, as recommended by the creators (Wellman & Liu, 2004). Participants tended to do well on the theory-of-mind battery ($M = 3.8$, $SD = 1.1$) and vocabulary measure, PPVT (raw score): $M = 91.3$, $SD = 17.3$.

The theory-of-mind battery behaved much as described by Wellman and Liu (2004), with increasingly more children failing as the tasks became harder, save for the two final tasks: Diverse Desires: 96.4% passing; Diverse Beliefs: 85.5%; Knowledge Access: 78.2%; Contents False-Belief: 58.2%; Real—Apparent Emotion: 65.5%. For each of the three hardest tasks (Knowledge Access, Contents False-Belief, and Real—Apparent Emotion), the children who passed the task were older than those who failed (ages reported in months), Knowledge Access: $M_{age_{pass}} = 65.3$, $SD_{age_{pass}} = 8.2$, $M_{age_{fail}} = 58.1$, $SD_{age_{fail}} = 5.9$, $t(53) = 2.84$, $p < .05$, $d = 1.01$; Contents False-Belief: $M_{age_{pass}} = 66.0$, $SD_{age_{pass}} = 8.2$, $M_{age_{fail}} = 60.5$, $SD_{age_{fail}} = 7.4$, $t(53) = 2.55$, $p < .05$, $d = .70$; Real—Apparent Emotion: $M_{age_{pass}} = 65.6$, $SD_{age_{pass}} = 7.2$, $M_{age_{fail}} = 60.1$, $SD_{age_{fail}} = 9.0$, $t(53) = 2.46$, $p < .05$, $d = .67$. A total of 32 children (58.2%) in our sample conformed to one of the 6 predicted patterns described by Wellman and Liu (2004; Table 4). No child failed all of the tasks, or passed only the first, but the average age for those conforming to the remaining patterns (passing first two, first three, first four, all five) increased as predicted (ages in months), Pattern 3: $M_{age} = 53.0$, $SD_{age} = 5.0$; Pattern 4: $M_{age} = 59.5$, $SD_{age} = 8.3$; Pattern 5: $M_{age} = 62.8$, $SD_{age} = 10.5$; Pattern 6: $M_{age} = 68.3$, $SD_{age} = 7.83$.

Table 2
Regressions predicting theory-of-mind performance.

	Variable	B	SE	β	t
Child storybook exposure					
Model 1	Vocabulary	.02	.01	.31	1.83
	Age	.03	.02	.27	1.65
	Gender	.14	.26	.07	0.56
	Income	−.04	.04	−.14	−1.03
Model 2	CBOOK	.04	.02	.30	2.23[*]
	Age	.05	.02	.42	2.48[*]
	Vocabulary	.01	.01	.15	0.89
	Gender	.11	.25	.06	0.44
	Income	−.04	.04	−.13	−1.02
Adult book exposure					
Model 2	ABOOK	.01	.02	.09	0.67
	Age	.04	.02	.30	1.76
	Vocabulary	.02	.01	.28	1.63
	Gender	.15	.26	.08	0.56
	Income	−.05	.04	−.16	−1.16
Child movie exposure					
Model 2	CFLM–PR	.04	.02	.30	2.37[*]
	Age	.03	.02	.24	1.49
	Vocabulary	.02	.01	.28	1.69
	Gender	.11	.28	.06	0.42
	Income	−.02	.05	−.07	−0.54
Child television exposure					
Model 2	CTV–PR	.02	.02	.19	1.47
	Age	.03	.02	.25	1.57
	Vocabulary	.02	.01	.29	1.74
	Gender	.10	.25	.05	0.37
	Income	−.05	.04	−.16	−1.24

Note: Model 1 is identical for all regressions. Removing Vocabulary from regressions did not change the pattern of results, nor did analyzing fiction and non-fiction subscales separately or substituting parental education for income.

  [*] $p < .05$.

3.2. Prediction of theory-of-mind by inferred book exposure

Hierarchical linear regressions were conducted, with control variables (Age, Gender, Vocabulary, Income) entered in the first block, followed by inferred exposure to children's storybooks (CBOOK) in the second (all regressions appear in Table 2). In Block 1, the control variables predicted 27% of the variance in theory-of-mind scores, $F(4, 46) = 4.25$, $p < .05$. The addition of inferred storybook exposure in Block 2 resulted in a statistically significant increase in prediction of the variance in theory-of-mind scores ($\Delta R^2 = .07$; $R^2 = .34$; $F(1, 45) = 4.97$, $p < .05$), and inferred exposure to storybooks was a unique predictor along with age. In order to see if a subset of the theory-of-mind tasks was best being predicted by inferred storybook exposure (beyond control variables), this regression was repeated using subsets of four, three, and two tasks, with the easiest tasks removed at each step to form subsequent groups. Only the four-task subset (Diverse Beliefs, Knowledge Access, Contents False-Belief, and Real−Apparent Emotion) resulted in a slightly larger beta for parental recognition of storybooks: .31, $t(45) = 2.26$, $p < .05$.

In order to demonstrate discriminant prediction, we examined whether a very similar measure of inferred exposure to adult books would predict theory-of-mind performance for children, hypothesizing that this would not be the case. A similar regression analysis was conducted (Model 1 is identical here, and in all subsequent regressions) and as hypothesized, inferred parental exposure to adult books was not a predictor in the final model (see Table 2), nor did it lead to a statistically significant increase in prediction of variance, $\Delta R^2 = .01$; $R^2 = .28$; $F(1, 45) = .45$, $p > .05$. It was investigated whether a subset of the theory-of-mind tasks would lead to increased prediction by inferred adult book exposure, but

in no case was inferred adult book exposure a statistically significant predictor. This lack of prediction for inferred adult book exposure is especially compelling in light of the shared method variance for the two measures of print exposure (CBOOK and ABOOK). Both involve simply ticking off names recognized from a list, and their inter-correlation was not trivial, $r = .55$, $p < .05$.

3.3. Prediction of theory-of-mind by inferred exposure to movies and television

Hierarchical regression analyses were conducted with respect to inferred movie and television exposure, with control variables again entered in Block 1. Inferred exposure to children's movies was a unique predictor (see Table 2), resulting in a statistically significant increase in predicted variance beyond that predicted by the control variables, $\Delta R^2 = .09$; $R^2 = .36$; $F(1, 45) = 6.37$, $p < .05$. When subsets of the theory-of-mind battery were investigated, it was again found that the four-task subtest resulted in a slightly larger beta for parental recognition of movie titles, $\beta = .32$, $t(45) = 2.54$, $p < .05$.

In contrast to these results, similar analyses demonstrated that inferred exposure to children's television shows was not a unique predictor of theory-of-mind (see Table 2), and introducing this variable did not lead to a statistically significant increase in predicted variance, $\Delta R^2 = .03$; $R^2 = .30$, $F(1, 45) = 2.17$, $p > .05$. Subsets of the theory-of-mind battery were investigated but in no case did any result in inferred children's television exposure becoming a statistically significant predictor.

4. Discussion

This study has shown that children whose parents are better at recognizing children's storybooks tend to perform better on theory-of-mind tasks. The degree of prediction appears to be substantial, resulting in a 26% increase in the prediction of theory-of-mind scores (from 27% to 34%), above key indicators such as age, sex, parental income and vocabulary. Moreover, we demonstrated that this effect is specific to the parental recognition of children's literature, as a nearly identical measure of inferred adult book exposure does not predict theory-of-mind performance. This dissociation increases confidence that the finding is not merely a function of how we measured exposure to print.

This study also demonstrated that the prediction of theory-of-mind abilities extends to children's movies, which increased prediction of theory-of-mind scores by 33% beyond other indicators. The same, however, could not be said of children's television. Since little previous research has examined how these forms of narrative media might relate to theory-of-mind in children, this is an important launching point for future research.

There are a number of possible mechanisms that could explain the observed relations. Conversation around mental states between parent and child might help foster the acquisition of a theory-of-mind. Discussion of mental states has been found to occur during joint reading of a wordless storybook (Ruffman, Slade, & Crowe, 2002; Sabbagh & Callanan, 1998), and such conversation occurs in this context at a higher frequency than during everyday conversation (Bartsch & Wellman, 1995; Dyer et al., 2000). Others have found that these types of conversations in the context of joint reading is associated with social understanding (e.g., understanding emotions; Garner, Carlson Jones, Gaddy, & Rennie, 1997), particularly if such conversation is initiated by the parent (Symons, Peterson, Slaughter, Roche, & Doyle, 2005). Talking about story characters and their desires, beliefs, and emotions appears to guide a child's growing understanding that people possess mental states.

It may also be that children are mentally simulating the events depicted (Mar & Oatley, 2008; Oatley, 1999), since previous work has demonstrated that children adopt the visuospatial perspective of story protagonists (Rall & Harris, 2000) and experience physiological reactions indicative of deep immersion in a story (Bar-Haim, Fox, Van Meenen, & Marshall, 2004). This deep simulation of the story events (Gerrig, 1993; Nell, 1988; Tellegen & Atkinson, 1974) may be related to imagination and pretend play (Carlson & Taylor, 2005; Harris, 2000), which often reveals a sophisticated understanding of fantasy (Skolnick & Bloom, 2006). Imagination and pretense also predict social ability, theory-of-mind, and social competence in children, and do so even after controlling for verbal intelligence (Seja & Russ, 1999; Taylor & Carlson, 1997) and socioeconomic status (Garner, Curenton, & Taylor, 2005). Since children's stories contain situations rich with social and mental-state information (Cassidy et al., 1998; Dyer et al., 2000), simulating story experiences may engage theory-of-mind

processes and foster their development. Other possible mechanisms no doubt exist, and it will take a program of future research to test competing predictions and uncover what drives these observed relations.

At present, it is unclear why the phenomenon observed extends to children's films but not children's television. Examining the differences between these two media could provide us with some clues. The most obvious difference between television shows and films is the continuity and length of their presentations. Television shows are interrupted by commercials and tend to run 22 min in length. Films are not interrupted in this fashion and are much longer. These differences in format could provoke more parent–child conversations about mental states, as perhaps parents are more likely to let children watch television alone, whereas films are watched together. Another possibility is that films allow for more mental simulation of events compared to television. Either possibility might help to explain why we see an association between inferred media exposure and theory-of-mind development for film but not for television.

A number of limitations to this study must be acknowledged. For one, the correlational nature of this study means that causality cannot be inferred. However, exposure to narrative media is not likely to be self-selected for children at this age, who cannot purchase or even read books on their own (for the most part), or control their access to other media. What media access or exposure that is sought by the child him or herself is not necessarily reflected in our parent-based measures of media exposure. While it is possible that children who have more highly developed theories of mind make more requests for narrative products, there is no guarantee that these requests are met by their caregivers. Moreover, even if these requests are filled, there is evidence that certain characteristics of the experience are important for fostering theory-of-mind development (e.g., mothers' mental-state utterances; Ruffman et al., 2002) and there is little way that a child could control these factors.

Our measure of media exposure was indirect, derived entirely from parents, and children may be exposed to storybooks, television, and children's movies in other environments such as daycare or preschool. Hence our study may have underestimated the magnitude of the relation between media and theory-of-mind. Although our checklist recognition measures ensured greater validity in measuring our media constructs compared to self-report (Sénéchal et al., 1996), these measures cannot tell us to what exactly children are being exposed. Parental recognition of items is a good proxy for overall exposure to a certain form or genre of media, but it cannot speak to the exposure (or frequency of exposure) to exact books, television shows, or movies. Future studies should combine the use of checklist measures with more explicit self-report, to balance the trade-offs associated with each. The nature of our media exposure measures makes some of our interpretations necessarily speculative. For example, the wide variety within each medium makes conclusions across media difficult, and it might be safest to conclude that the association we observed was variable across different media.

Our participants also performed well on the theory-of-mind battery, which means that these scores likely suffered from some restriction of range. Reduced variance in our dependent variable decreased the likelihood of any effect; as a result our current results may reflect an underestimation of the magnitude of the observed relation. Lastly, while we have controlled for parental income, there could be other parental variables not tapped by these assessments that are more directly responsible for the effects identified here. Future studies designed to address these issues are clearly warranted.

Although our study cannot speak to any specific mechanism underlying the observed effect, it demonstrates an important phenomenon (Rozin, 2009). There appears to be growing evidence of the existence and generality of a relation between inferred media exposure and theory-of-mind development (Adrian et al., 2005). A recent study conducted in Israel, for example, found that expertise in choosing children's fiction on the part of mothers predicted teacher ratings of empathy and socioemotional adjustment of their children, even after maternal education was statistically controlled (Aram & Aviram, 2009). Although a number of researchers have suggested a possible association between storybook reading and theory-of-mind development, not enough work has been done to demonstrate this association, capitalizing on the variation of storybook knowledge identified among parents. Our study adds to this growing body of work, while controlling for a number of key variables and also extending this examination to other media.

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