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## The effects of reading material on social and non-social cognition



Jessica E. Black<sup>\*</sup>, Jennifer L. Barnes

University of Oklahoma, United States

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### ABSTRACT

The purpose of this study was to investigate the effects of reading material on both social and non-social cognition. Prior research supports the hypothesis that reading fiction improves theory of mind (Kidd & Castano, 2013; Mar, Oatley, Hirsh, de la Paz, & Peterson, 2006; Mar, Oatley, & Peterson, 2009); however, little has been done to test its effects on other cognitive abilities. In this study, we tested the effect of reading literary fiction vs. non-fiction on both theory of mind and intuitive physics understanding. In line with previous research, results indicate a small but significant within-subject effect of reading material on theory of mind once other variables are controlled. Although the experimental manipulation (literary fiction vs. nonfiction) had no effect on intuitive physics understanding, we found that familiarity with fiction predicted intuitive physics ability. These results are discussed in terms of theories of fiction.

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Reading for pleasure has been associated with better reading and writing performance in school, improved second language acquisition, increased understanding of other cultures and general knowledge, and greater community participation (Clark & Rumbold, 2006). People have speculated on the function of fiction at least since Aristotle (350 BCE/1902), but only in the last few decades has fiction been an object of research in psychology. What does reading *do* that makes it both enjoyable and beneficial? One answer to this question involves the effect of reading on theory of mind (cf. Djikic, Oatley, & Moldoveanu, 2013; Fong, Mullin, & Mar, 2013; Kidd & Castano, 2013; Mar, Oatley, Hirsh, de la Paz, & Peterson, 2006; Mar, Oatley, & Peterson, 2009). Theory of mind (ToM) is the ability to infer and reason about mental states: our own and other people's beliefs, desires, and intentions (Malle, 2006). Also referred to as *mind reading* (e.g., Zunshine, 2003), ToM demands that we understand that other people are agents, with both intentions and emotions that we can interpret and use to predict their behavior (Baron-Cohen, Wheelwright, Spong, Scabill, & Lawson, 2001; Kidd & Castano, 2013).

Recent experimental research suggests that reading literary fiction (compared to nonfiction and popular fiction) may indeed enhance ToM (Kidd & Castano, 2013). These findings are in line with prior correlational research reporting that people's exposure to fiction, but not to nonfiction, was associated with increased scores on a ToM task (Djikic et al., 2013; Mar et al., 2006; Mar, Oatley, et al., 2009; Mar, Tackett, et al., 2009). Similarly, it has been shown that children exposed to more fictional media outperform their same-age peers on ToM tests (Mar, Tackett, & Moore, 2009). Research with people with autism spectrum conditions (ASC) gives convergent evidence: people with high-functioning autism seem to prefer nonfiction to fiction (Barnes, 2012), and do worse on ToM tasks compared with neurotypical controls matched by age and

<sup>\*</sup> Corresponding author at: Department of Psychology, University of Oklahoma, Dale Hall Tower, Room 705, 455 W. Lindsey, Norman, OK 73071, United States. Tel.: +1 4053254511.

E-mail address: [jessica.black@ou.edu](mailto:jessica.black@ou.edu) (J.E. Black).

intelligence (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001; Baron-Cohen, Wheelwright, Spong, et al., 2001). At the same time, individuals with ASC do better than neurotypical controls at tasks that depend on understanding systems and physical causality (Baron-Cohen, Wheelwright, Spong, et al., 2001; Baron-Cohen, Richler, Bisarya, Guronathan, & Wheelwright, 2003; Baron-Cohen, 2010).

It has been suggested that the ability to understand people may compete in some way with the understanding of physical systems (Baron-Cohen et al., 2003; Baron-Cohen, 2009, 2010). Baron-Cohen proposed an explanation for autism that highlights the spectrum of individual differences that exists in both the ability and desire to understand the design and function of physical, rule-based systems and the ability and desire to understand the emotions, thoughts, and intentions of other people (Baron-Cohen et al., 2003). Individuals on or close to the autism spectrum tend to self-report higher scores on the former and lower scores on the latter when compared to neurotypical controls (e.g., Baron-Cohen & Wheelwright, 2004; Baron-Cohen, 2010; Goldenfeld, Baron-Cohen, & Wheelwright, 2005; Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004; Wheelwright et al., 2006). Although these two types of abilities—understanding and responding to the emotions and thoughts of others and constructing and reasoning about physical, rules-based systems—are not necessarily related to each other, people who are higher in one tend to be lower on the other. Cross-culturally, women self-report, on average, a stronger affinity for understanding and responding to mental states and emotions than men do, whereas men score higher than women on a self-reported interest in and ability to reason about non-social systems (Wakabayashi et al., 2007; Wright & Skagerberg, 2012).

Although much of the research contrasting these two types of abilities uses self-reported measures (see Baron-Cohen, 2010 for an overview), performance-based tests have also been developed to examine the ability to read emotions and the ability to reason about physical objects. For example, the Reading the Mind in the Eyes test (RME; Baron-Cohen, Wheelwright, Hill, et al., 2001) shows participants a series of photographs of different people's eyes and asks them to identify the emotion depicted in each photograph. In contrast, the Intuitive Physics Test (IP; Baron-Cohen, Wheelwright, Spong, et al., 2001) measures participants' ability to reason about rules-based systems by asking them to indicate their understanding of physical causality based on a series of drawings. Prior research has shown that children with Asperger Syndrome do better on the IP and worse on the RME than neurotypical controls (Baron-Cohen, Wheelwright, Spong, et al., 2001). Although both the RME and the IP were originally developed for use with individuals on the autism spectrum, subsequent research has shown significant individual differences in performance on both tests within neurotypical populations as well (e.g. Brosnan, Gwilliam, & Walker, 2012; Wakabayashi, Sasaki, & Ogawa, 2012).

It is for this reason that the RME has often been used as a measure of ToM in research on fiction (e.g., Djikic et al., 2013; Fong et al., 2013; Kidd & Castano, 2013; Mar et al., 2006; Mar, Oatley, et al., 2009; Mar, Tackett, et al., 2009). A history of reading fiction, as assessed by familiarity with author names, has frequently been associated with higher scores on the RME (e.g., Djikic et al., 2013; Kidd & Castano, 2013; Mar et al., 2006), accounting for variability in scores on the RME over and above openness, age, experience, and fantasizing (Mar, Oatley, et al., 2009; Mar, Tackett, et al., 2009). Kidd and Castano carried out an experimental study in which participants were randomly assign to read either literary fiction or nonfiction, and then took the RME: participants scored higher on the RME after reading literary fiction than nonfiction, even after controlling for past exposure to fiction. In four subsequent studies, the effect of reading literary fiction was compared to the effect of reading popular fiction, and it was found that people consistently perform better on the RME after reading literary rather than popular fiction.

Although Kidd and Castano's (2013) experimental study provided support for the idea that reading literary fiction facilitates social cognition, the researchers did not investigate the effect of reading literary fiction on any non-social cognitive tasks. One possible interpretation of these results is that reading literary fiction facilitates our understanding of other people's minds *per se*. However, it is also possible that reading literary fiction may facilitate performance on a wider variety of cognitive tasks, including, but not limited to, those involving social cognition. In contrast, given the body of autism research reviewed above, it also seems relevant to ask whether reading literary fiction may improve our ability to read emotions at the expense of our ability to reason about physical systems.

Prior research has not investigated the effect of reading literary fiction (versus nonfiction) on performance on non-social cognitive tasks, such as the Intuitive Physics Test. Two possibilities exist: reading literary fiction may only affect ToM, or it may affect both ToM and the ability to reason about physical objects. If reading literary fiction does affect the ability to reason about objects, it could do so in one of two ways. It could be that the improvement in ToM ability seen after reading literary fiction corresponds to a decrease in the intuitive understanding of physical systems, in line with theories that contrast these two suites of abilities or the idea that reading fiction may flip participants into "people mode." Alternatively, reading literary fiction could improve *both* abilities. Under this view, the association of reading literary fiction with improved ToM could be evidence of the contribution of reading fiction to overall cognitive ability. For instance, perhaps fiction—particularly challenging fiction, such as the literary fiction found to increase ToM performance in Kidd and Castano (2013)—cues critical thinking, problem solving, and intellectual engagement and results in facilitating subsequent cognitive performance, whether the subsequent task is social or not.

The purpose of this research was to replicate and extend the research of Kidd and Castano (2013). We chose to focus on the effects of reading literary fiction versus nonfiction for two reasons. First, Kidd and Castano showed, in four experiments, that people tend to score higher on the RME after reading literary rather than popular fiction, but only one of their five experiments examined the effects of reading literary fiction versus nonfiction. Thus, because a goal of this research was to replicate the original findings, we focused on the condition (literary fiction versus nonfiction) that was not extensively

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