

Review

Fiction: Simulation of Social Worlds

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Fiction is the simulation of selves in interaction. People who read it improve their understanding of others. This effect is especially marked with literary fiction, which also enables people to change themselves. These effects are due partly to the process of engagement in stories, which includes making inferences and becoming emotionally involved, and partly to the contents of fiction, which include complex characters and circumstances that we might not encounter in daily life. Fiction can be thought of as a form of consciousness of selves and others that can be passed from an author to a reader or spectator, and can be internalized to augment everyday cognition.

Simulation and Social Understanding

Plato [1] distrusted literary art and wrote of it as a 'mimesis', an imitation. He argued that, in daily life, we see only shadows, not unchanging truths, such as those of mathematics. As an imitation of the everyday world, art is yet further removed from truth: a shadow of a shadow. Plato's line of thinking may be among the reasons why literary art has, until recently, not been of much interest in cognitive science.

More helpful than ideas of imitation and shadows is the proposal [2] that a piece of art is a metaphor: a 'this' is a 'that'. In the oldest-known cave painting at Chauvet [3], a set of marks made on a cave wall 31 000 years ago (a 'this') is a rhinoceros (a 'that'). Burial mounds from the same period imply that stories were told about someone dead ('this') who was alive in memory or on another plane ('that'). It is a semantic idea, in which, by mapping from one domain to another, we extend our understanding [4]. In evolutionary terms, art is an addition to the mind that is both recent and fundamental to our humanity. Science, too, is enabled by this same kind of thinking: a scientific theory is a kind of metaphor [2].

At the time of Plato and Aristotle, 'mimesis' had two meanings [5]. The first was imitation and its cognates; the second was 'world-making' or 'world-creating'. In Aristotle's *Poetics* [6], 'mimesis' was the central concept, probably mainly in the second sense for which the modern term is 'simulation': meaning a complex metaphor extended in time [7–11]. Fiction is a set of simulations of social worlds that we can compare, as it were stereoscopically, with aspects of our everyday world, to suggest insights we might not achieve by looking with the single eye of ordinary perception. Recent findings indicate that those who engage in such simulations, readers of literary art, which is mostly fiction, have better understandings of other people than those who do not. These findings could not have been made if Plato's misgivings were well founded.

An important step in research on this issue was the finding [12] that, after controlling for factors of age, IQ, level of education, and so on, the more people read, the better were their vocabulary, general knowledge, and other verbal abilities. The test of reading was the Author Recognition Test, in which people are given a list of names and check those that they recognize as authors. This measure is a close proxy for how much reading people do as measured by diaries,

Trends

In long-term associations and shorter-term experiments, engagement in fiction, especially literary fiction, has been found to prompt improvements in empathy and theory-of-mind.

Improvements of empathy and theory-of-mind derive both from practice in processes such as inference and transportation that occur during literary reading, and from the content of fiction, which typically is about human characters and their interactions in the social world.

Comprehension of stories shares areas of brain activation with the processing of understandings of other people.

Both fiction and everyday consciousness are based on simulations of the social world; thus, reading a work of fiction can be thought of as taking in a piece of consciousness.

The study of fiction helps us understand how imagination works to create possible worlds, and how mental models are formed of others and ourselves.

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questionnaires, and behavioral means. A meta-analysis of effects of reading, including leisure reading [13], shows that people who read more at an early age are more successful students. Moreover, early reading predicts both verbal skills and the amount of reading that people do later in life [14].

A modified Author Recognition Test includes authors of fiction, such as Alice Munro and Italo Calvino, and of non-fiction, such as Noam Chomsky and Susan Sontag [15]. With this modification, people's reading of fiction and nonfiction can be estimated separately and, in this way, it has been found [16] that the superior verbal abilities attributed to general reading are due largely to reading fiction rather than explanatory nonfiction.

The first to show a social effect of reading fiction was Hakemulder, who called fiction a 'moral laboratory' [17]. He found decreased acceptance of norms about male–female relations in Algeria among people who read part of a novel about experiences of an Algerian woman, as compared with people who read part of a nonfictional essay on the same subject. In a comparable way, it has been found [18] that reading a piece of fiction about a counter-stereotypical Muslim woman reduced bias in perceptions of Arab and Caucasian faces. Among the implications are that fictional characters enable one to imagine what it might be like to be in other people's situations.

If fiction is the simulation of social worlds then, similar to people who improve their flying skills in a flight simulator, those who read fiction might improve their social skills [15]. Fiction might be the mind's flight simulator. The main outcome measure used in this research is the Mind in the Eyes Test [19], in which participants view 36 photographs of people's eyes and for each choose among four terms to indicate what the person was thinking and feeling (Figure 1).

The Mind in the Eyes Test is an index of empathy and theory-of-mind that is not based on narrative; therefore, effects cannot be explained by verbal competencies. Empathy can be thought of as having an emotion similar to that of another person, which is elicited by seeing or thinking about the person, and knowing the other is the source of the emotion [20,21]. 'Theory-of-mind' is used by psychologists to mean inference about what another person is thinking. It is also called 'mind-reading' and it overlaps with inference about what the person is feeling [22]. Its neural bases and relation to empathy are becoming understood [23]. Another measure used in this research [15] was the Interpersonal Recognition Test [24], in which participants answer questions about what is going on among people in 15 video clips. Figure 2 shows partial correlations for effects of reading fiction and nonfiction, controlling for the tendency to read regardless of genre, as well as for age and education. For social understanding indicated by the Mind in the Eyes Test, reading fiction gave rise to significantly higher partial correlations than did reading nonfiction. With the Interpersonal Recognition Test, effects were in the same direction but smaller.



Figure 1. Item from the Mind in the Eyes Test. In the test, people view 36 photographs, of which this is one, and choose among four terms to indicate what each photographed person was thinking and feeling. For this example, the four terms are 'reflective' (correct), 'aghast', 'irritated', or 'impatient'. The test is by Baron-Cohen *et al.* [19].

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