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# **The Biological Influence of Stories & The Importance of Reading Fiction**

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## **ABSTRACT**

Fictional narratives and stories have persisted throughout human history. However, perhaps due to a bias that stories offered nothing more than entertainment for the reader or perhaps that they are not useful outside of the realm of academia, the research within science academia has been lacking in literature on why these narratives have endured. Unfortunately, due to the lack of conversation across disciplines, particularly those of science and literature, this subject has not been thoroughly investigated through an interdisciplinary lens. Within this paper, the goal is to analyze the benefits of fictional narratives through biological, evolutionary, and neuropsychological perspectives. Research has been cross-referenced across primary and secondary sources varying from peer-reviewed scientific journals to psychological experiments. The following findings from the sources were corroborative with the original thesis that narrative goes beyond being a method of entertainment or only a thing of merit within English scholarship. Rather, stories are found to be crucial for developing empathy and Theory of Mind through the use of mirror neurons within the brain. This unique ability to build empathy allowed stories to spread within human society since it decreased the risk of free riders—those who take advantage of a society without equal contribution—and increased social bonds within the communities. In addition to these advantages, narratives provide ways to transfer information and experience that may be critical for survival. Altogether, stories are far more important to human survival and success as a species than previously considered.

**Keywords:** Reading, Neuroscience, Evolution

## **Introduction**

The goal of this interdisciplinary research will be to analyze the neurological, psychological, and evolutionary underpinnings behind why humans, as a species, enjoy reading fictional narratives as well as what benefits they derive from these stories. For the purpose of this paper, while narrative format exists within both fictional and nonfictional stories, the former will be what is primarily investigated since there is more research on fictional narratives effects,

and the thesis is looking to understand the importance of fiction itself. The literature and evidence collected for this undertaking will include research from cognitive science, neurology, human evolution, psychological human development, and literacy theory. Primarily, this paper will investigate the evolutionary advantages of reading narratives, its effects on learning and social and psychological development, with emphasis on empathy, and the neurological processes that allow for reading and the enjoyment of fictional narratives.

The driving purpose of this research, beyond looking for explanatory reasons for why humans read fiction, is to explore the importance of literature in the human experience and how stories can influence people to be more empathic. In “Theory of Mind in Reconciling the Split Object Narrative Comprehension,” Murphy notes that “all known human societies process information in terms of stories, and no known other animal species do” (58). Since stories are clearly crucial to human lives and their societies, it begs a question: Why has this need for narratives evolved, and what adaptive purposes do narratives serve in the survival and betterment of the human race? Current findings and research suggest that narratives not only improve empathy, a vital skill in social communities, but also allows for greater survival capabilities by providing a sort of creative laboratory to experience new possibilities and situations without the cost of living through them (Armstrong 144). Although this field of study, the blend of neuroscience and literature, has long been neglected since stories have been thought to be simply for entertainment purposes, the evidence seems to suggest otherwise. While stories can provide entertainment, which is in part why our brains love them, they go beyond being mere media for consumption (Kelly 74). Stories shape our lives, our ability to think and to empathize, and our ability to thrive as a communal species.

### **Literature Review**

For the underpinnings of the thesis, the evidence is divided into three disciplinary sections: human evolution, psychological development, and neuroscience of narratives. This research is interdisciplinary in nature because, as Paul Armstrong aptly wrote, “there are many good reasons to undertake cross-disciplinary studies, but one

compelling justification is that a problem one wants to solve cannot be adequately addressed with the tools of one’s discipline alone. That is clearly the case with neuroscience and art, or in our case, stories (1).

### **Human Evolution of Stories**

Robin Dunbar, in his article “Why are Good Writers so Rare? An Evolutionary Perspective on Literature,” begins his analysis of the evolution of narrative based upon the premise that the cost in time and effort that humans have spent in stories suggest that it must have some sort of tie in biology since “anything that costly in real life almost certainly has a biological function” (7). His main theory is that narratives evolved to help bind communities and to discourage the development of free riders within those societies (9). Free riders are a detriment to societies, especially ones that are forming, since they do not contribute to the success of the community. Others within this field, like Meretojia and Lyytikainen and Mar and Oatley, further the idea that stories are built within human evolution as an adaptive strategy for survival.

In “Why We Read: The Plural Values of Literature,” authors Meretojia and Lyytikainen note that most research on the area “usually emphasizes the centrality of imagination for our survival and planned actions” (13). Mar and Oatley follow a similar line of thought with narratives being used as a form of simulations for the human brain. This ability to imagine scenarios could aid in their survival by allowing humans to gain the experience of the narrative without the risk of real-life experience (Mar and Oatley 183).

However, in Mar and Oatley’s paper,

“The Function of Fiction is the Abstraction and Simulation of Social Experience,” they go beyond Lyytikäinen’s and Meretojia’s paper on the evolutionary benefits of imagination and narrative use of morals. Rather, they suggest that reading also has the value of transferring social knowledge and providing tools to navigate social situations (182). While these writers offer differing views of why stories evolved, the central theme seems to stem from the idea that humans are social creatures and, as such, have to learn to survive within communities; narratives can aid with this form of social survival.

### **Learning and Psychological Devolvement of Reading**

In “The Neuroscience of Stories and Why our Brains Love Them,” Kelly explores the effects of using narratives for education due to the fact that the human brain is able to remember a story longer, and in more detail, than expository information (73). This seems to be due to the nature of stories being composed in a cause-and-effect formula (80). However, this unique effect that stories have on learning with the human brain seems to go even further beyond a simple study tool; it seems to also be involved in the neuropsychological phenomenon known as the Theory of Mind. In *How Literature Plays with the Brain*, Armstrong defines the Theory of Mind as a process “to engage in mind reading, through which we theorize about the beliefs, desires, and intentions of others, which we recognize may differ from our own” (132). This article explores how stories impact Theory of Mind, and how stories are involved with developing Theory of Mind within children.

While Armstrong aims to look at the processes on literature and neuroscience

objectively, Murphy takes these tested theories and hypotheses further. In Murphy’s “Theory of Mind in Reconciling the Split Object of Narrative Comprehension,” he takes the connection between the correlation of reading and strengthening Theory of Mind in psychological development and suggests that it is possible that “intense social circulation of narrative is involved in instantiating ToM” (66). Armstrong acknowledges that stories seem to help build Theory of Mind (ToM), since they offer insight in the minds of others, though fictional (135). While Murphy’s hypothesis is not yet proven on whether or not stories create Theory of Mind, stories do have proven ties to empathy. In a similar vein of allowing someone to see the world through another’s eyes, empathy is the process of feeling someone’s emotions as if they were your own. Reading narrative literature, unlike other forms of creative arts, allows for this experience in a unique way since the reader is quite literally reading the character’s mind. While in visual arts, such as movies or paintings, the character is shown, and their actions depicted; their thoughts are not realized in the same way as they are in narratives. Narratives allow for the character’s thoughts and point of view to read in greater clarity than in these other art media. Since stories allow for this introspective view, they might be able to have a greater impact on building empathy than other forms of art.

In an experiment designed to examine reading habits and changes in attitudes and emotions, Lenhart et al. note that “self-reported empathy...[was] positively related to the reading of narrative literature” (10). In a similar experiment, looking into the effects of emotions in a story told in narrative or expository form, Djikic et al. found a similar connection. However, this team also noted

that “exposure to fiction, unlike exposure to nonfiction, predicts a more positive performance on a variety of social ability measure,” including empathy (Djikic et al. 28). Much like Kelly’s research suggested, there seems to be something unique about the narrative format used within stories. The human brain simply reacts in a different way to story narratives than it does to expository forms of communication.

### **Neurological Processes of Reading Narrative Stories**

Alongside Kelly’s review of stories and learning, he covered how neurotransmitters were involved in stories. The main three neurotransmitters that are involved during reading stories are: dopamine, cortisol, and oxytocin (Kelly 80). He focused primarily on the effects of dopamine because this neurotransmitter is involved with drive, reward, and learning. He also noted the effect of cortisol, which helps to increase focus and could also support learning. What was the most interesting, however, was the involvement of oxytocin, a bonding transmitter. The involvement of oxytocin could help explain how stories worked in creating communities that relied on each other as well as to help discourage free riders from taking advantage of the benefits of these societies because oxytocin works to create chemical bonds and, as such, strengthen human relationships. However, the main focus in the study of neuroscience and narrative is the discovery of mirror neurons.

Like their name suggests, mirror neurons respond to someone else performing an action. These neurons that are tied to performing this action also fire in the brain of the observer (Armstrong 211-212). This could explain why narratives help to build

empathy and Theory of Mind. Armstrong explores this involvement of mirror neurons more in “How Historical is Reading.” In this text, he dives into the discovery of these mirror neurons in monkeys and how mirror neurons lead to the brain engaging in narrative stories (211). This evidence of concerning mirror neurons and how they interact within the human brain will be examined later in this article.

While the literature collected to explore the topic of narratives prevailing in the human species is diverse in nature, expanding from areas of evolution to psychology and to neurobiology, together, they offer a greater picture of why narratives have come to be and why they appear to be universal within the human race. From evolving to aid survival and build communities, working with the psychological development of the human mind and cultivating empathy, the reach and importance of stories stretch to all points of human life and are, in many ways, some of the things that fosters humanity.

### **Methodology & Results**

The primary type of data that is assessed within this research is a combination of scientific articles, literary articles, and raw statistical data from experiments, mainly from neuro-psychological experiments. Since this thesis is rooted in both the fields of literature and biology (particularly neurobiology), the collections of data from each of these disciplines vary in how they were conducted. Those collected from the biological findings are primarily focused on statistical evidence, neuropsychology findings in both experiments and surveys, evolutionary evidence from past records, and developmental psychological experiments and documentation. As for the research on

narratives, most of it is from the lens of writing and how stories play with the reader's brain and what makes for good writing. The findings from this research will help to feed back to the biological findings to help paint a clearer and more rounded picture of why humans enjoy stories and are impacted by them.

However, most of the data used here is attained by researchers who have intentionally worked with an interdisciplinary approach. There is, more recently, a growing interest in neurolinguistics and evolutionary biology within the development of stories. This is a developing field, and more researchers, from literature and biological sciences, have been working together to collaborate on new research for this field of study.

Unfortunately, however, since this is still a new discipline of interest, the research is currently limited in its quantity. From the limited findings collected in the Literature Review section, it appears that collaborations between these two disciplines doesn't occur often since literature and the biological sciences do not seem to normally be in direct conversation with each other. Due to this, the range of research available is not as in depth as it could be to support this thesis. It's quite possible for new research to come out that may contradict the thesis or provide further groundings for stories being vital for the human race, for their development and evolution as a species. Hopefully, the interest in this topic will continue to spread, and more information will come to light on the relation between stories and humanity.

### **Findings & Discussion**

Before analyzing why stories are essential to the human species in modern

times, it is important to discover why and how the need for narratives evolved. As previously noted, Dunbar, in research of the evolution of literature, the biological cost of stories and effect they have on the human brain does suggest that there must be some evolutionary purpose of the creation and persistence of stories in the human race (7). Since "there is evidence that literature in some form was an integral part of human cultures already in prehistoric times," there likely has to be a survival benefit of narratives (Meretoja et al. 5). While modern times have provided the safety and comfort of luxuries, early evolving humans did not have such benefits. If the adaptation were not advantageous to survival of the species, it would be weeded out in the next generation. Yet, stories have continued to persist. In response to this question, Dunbar proposes that "story-telling is yet another mechanism that we have evolved to combat the corrosive and destructive effects of freeriders...because it helps to bind the members of the community together" (9). These community bonds are likely due to the rise in emotional intelligence and empathy that the narratives foster. It is quite likely that the discovery of mirror neurons could explain why stories have led to building empathy and bonds. Moreover, Kelly's research has shown that neurotransmitters, like oxytocin, are involved in reading narratives (80). Because oxytocin is known for its role in building bonding between humans, it makes sense that this transmitter would have a role in the creation of community bonds formed by stories.

In Meretoja et al.'s research, the team noted that "after reading fiction, people do better on tests that measure empathy, social perception, and emotional intelligence" (3). These results are likely due to stories and reading fostering the Theory of Mind, the

“capacity to attribute mental states to others” (Armstrong 132). Putting oneself in another’s shoes, so to speak, can build empathy and understanding. This ability to empathize and bond with fellow humans allows for tighter knit groups, which in turn allows for better survival chances by removing the growth of free riders (Dunbar 9). Since empathy allows for people to care in a deep intimate way for their fellow human, they are less likely to take advantage of each other.

However, this ability of imagination that stories provide serves another purpose beyond social skills. Meretoja et al. note that current “research conducted by cognitive psychologists usually emphasizes the centrality of imagination for our survival and planned actions and sees the importance of literature as residing primarily in its ability to promote our imaginative abilities” (13). Following this line of thought, Mar and Oatley remark, “stories model and abstract the human social world. Like other simulations (e.g., computer models), fictional stories are informative in that they allow for prediction and explanation while revealing the underlying processes of what is being modeled” (173). In a sense, stories allow people to have multiple experiences without any negative effects. By allowing them to imagine what they may do in a certain situation, stories better prepare people if such a situation were to arrive. Like practice exams, stories help people to prepare ahead of time for the potential hurdles of life.

The benefits of both empathy and imagination are provided through narratives by neurological phenomenon of mirror neurons. Mirror neurons are neurons that fire in the same manner that any neuron would if one was doing a task—except they fire by simply seeing or reading the task being performed (Armstrong 212). Kelly’s research

in the neuroscience of learning, in particular, reveals that stories may also have the additional benefit of not only passing on knowledge but also being in a format that the brain can easily recall (76). These findings suggest that the psychology of narrative has a profound effect on the neuroscience of the workings of the human brain.

Within the Literature Review sections of this paper, these evolutionary aspects of why human beings acquired narratives were assessed, primarily through the idea of discouraging free riders through the development of empathy and through the notion of narrative creating an imagination laboratory. Meretoja et al.’s paper, “Why We Read: The Plural Values of Literature,” goes into great detail of how this development of empathy would work to create a functioning society – by eliminating Dunbar’s free riders. The authors empathize that not only can literature “help us understand social values and can contribute to establishing and strengthening certain affective abilities, capacities to feel empathy and solidarity and understand social mechanisms that would otherwise remain difficult to grasp,” but that “literature reflects and represents the values of society, and it takes part in constructing, articulating, and negotiating new values in society” (16-17). Much like Dunbar suggested, due to narrative’s ability to create a tighter knit society, narratives also shape and help to form the society in the process (9). However, how precisely does narrative accomplish such a task of forming a society and building empathic connections?

As mentioned previously, this development of empathy and Theory of Mind appear to be intertwined, as the Theory of Mind in psychology relates to the ability to understand and imagine the thoughts and

mental states of others (Lenhart et al. 1). In Murphy's article, he takes this idea further, suggesting that narrative is not only correlated with the development of Theory of Mind but helps to create this phenomenon (Murphy 66). He suggests that this is an "adaptive function of narrative" (66). In Lenhart et al.'s article, it was noted that "studies with young children showed the frequency of shared-book reading and parents' use of mental state talk were correlated with children's theory-of-mind development" (2). This research from Lenhart et al. works to support Murphy's theory of Theory of Mind since it shows how this theory is actively at play within school age children.

Another compelling experiment is from Mar and Oatley's research. Within their paper, "The Function of Fiction is the Abstraction and Simulation of Social Experience," they recorded two studies: one conducted by Litcher and Johnson in 1969 and another conducted by Katz and Zalk in 1978. Both studies were done with White, elementary-school-aged children who were already prejudiced towards the Black community. They found in both these studies that "children who read stories with multi-ethnic characters [had their] attitudes towards African-Americans markedly improved" (Mar and Oatley 181). What was most surprising about these studies, however, was that "this manipulation [reading stories] proved more effective than having White children interact with African-American children on a shared task, and the positive influence of the story intervention was still present after a 4-month interval" (181). While empathy and Theory of Mind explain the nature of this phenomenon occurring within these experiments, they do not explain how. As previously mentioned, there seems to be evidence to suggest that this empathy

and Theory of Mind are able to develop due to the mirror neurons within the brain.

As discussed previously, these mirror neurons are "cells in the brain that fire both when an action is observed and when the same action is enacted by the observer" (179). This was first recorded within macaque monkeys, but through modern technology, it has also been observed within humans (Mar and Oatley 179). As noted by Kelly, from research conducted by Widrich in 2012, a study done with a "person telling [a] story...would have different areas of the brain firing up as she told it. The brains of the listeners started doing the exact same things in the same order" (82). However, these mirror neurons fire within emotional cognitive areas of the brain as well. Armstrong, in "How Historical is Reading," noted that "experiments have shown that mirroring processes are evident not only in the motor cortex but across the brain, in regions associated (for example) with emotion, pain, and disgust" (213).

This could be tied to why neurotransmitters—particularly dopamine, cortisol, and oxytocin—are released during reading narratives, as Kelly notes in his article, "The Neuroscience of Stories and Why our Brains Love Them" (80). Kelly notes within his research that "neuroscientist Paul Zak... found that touching stories cause the release of both [cortisol and oxytocin], resulting in greater attention, more sympathy, and changes in attitudes" (80). What was more amazing was that the release of these neurotransmitters and possibly firing of mirror neurons did more than just arouse emotions. The neuroscientist, Paul Zak, also found that after seeing a touching narrative, "people were more willing to give money to strangers in need, or charities" (80). This ties in with Djikic et al.'s theory that "changes in emotions may, at least for some individuals,



lead the way toward more permanent changes in personality structures” (25). Zak’s study, along with the ones that recorded prejudiced White students, appear to show that narratives do impact the lives and attitudes of the readers. This positive change also supports Dunbar’s theory of narrative having evolutionary underpinning by fostering empathy and connections with a society.

Moreover, while narratives have shown through psychological and neurological support to increase empathy and self-change, narratives also allow for a creative simulation space. As noted previously by Lenhart et al., stories allow for the brain to experience situations, and gain knowledge from the simulated situations, without having to live through them (2). Lenhart et al. also theorize that it is possible, through narrative simulations, that the experiences gained there “might then transfer to social-cognitive skills in real-world social situations” (8). The reason this works uniquely in narrative is because “whereas expository representations tell us information, literary narratives show us things by having us experience them first-hand” (Mar and Oatley 177). Much like the ability to develop Theory of Mind and empathy, mirror neurons are “a possible candidate for the basis of such a simulation system” (179). This unique ability of narrative clearly propels human evolution since it works “as a human adaptive strategy to maximize our chances for survival by allowing us to watch safely the experiences of others and extract valuable lessons” (Meretoja and Lyytikainen 14).

### **Conclusion**

While it is shown that although stories can be entertaining, they are also crucial to the human experience and survival.

Unfortunately, the study of the science behind fiction and its importance within the human species has largely been ignored because stories were thought to be merely only for amusement (Murphy 68). There is also a lack of research due to the interdisciplinary nature of this research; however, that will likely change as more fields are developing and encouraging interdisciplinary approaches. Hopefully, the findings presented within this article will highlight the need for further research and show the promise that stories have. Stories have evolved and continue to persist within human societies because they are able to enact profound changes and effects within the human psyche. They have the ability to shape human societies and minds by fostering empathy, by providing a unique change to view the world through someone else’s eyes, and by strengthening the development of Theory of Mind. Fictional narratives and stories allow for the chance to create entire worlds and scenarios for humans to experience—without ever straying from the pages. To put it simply, “this private experience [of stories] allows us to feel and know...and to see the world through the eyes of others as we cannot in real life” (Armstrong 135). Stories are, in many ways, what composes humanity and allows for humanity to survive as a community.

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