



ABSTRACT

Gender norms and stereotypes are deeply rooted in society and are reinforced through the recreation of cultural products. Our analysis of thousands of novels, movie synopsis, and movie scripts reveals how these culture products promote gender stereotypes in a quiet but strong way. We start from demonstrating how the happiness of Cinderella depends on the Prince but not vice versa. This analysis, based on the word embedding technique, provides a novel approach to identify how gender stereotypes in our case, men are women's way to happiness - are created in stories through a carefully designed narrative structure. This structure of narrative builds up and enhances "Cinderella complex", women's fear of independence and unconscious desire to be taken care of by others. The used computational techniques allows us to scale up analysis to include 1,327 novels, 6,657 movie synopsis, and 1,109 movie scripts, which covers a substantial portion of collective narratives as both the consequence and the cause of how society thinks. The observed widely existence of "Cinderella complex" across periods and cultures reminds the necessary to combat against it through the creation of new narrative in education, policy, and beyond.

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INTRODUCTION

In our work, we present computerized frame analysis that goes beyond aligning words and gives the shape of stories as product of gender stereotypes. Inspired by Kurt Vonnegut's theory of universal story shape, Reagan et al. measured sentiment over time. Their method involves creating a dictionary of words and their sentiment scores and then calculate the average scores of paragraphs to map the ups and downs of story. We propose that word embeddings techniques provide a powerful, alternative way to infer the sentiment scores of words by calculating the cosine distance from their pre-trained vector representations to a constructed "happiness vector" representing the dimension of "unpleasant - pleasant". By tracking the words around two main characters in the story of Cinderella, we found the happiness of Cinderella depends on the Prince but not vice versa. Following Colette Dowling's theory we call this phenomena Cinderella complex, which describe women's fear of independence and unconscious desire to be taken care of by others (Colette Dowling, 1981). By analyzing a large size of stories using word embeddings, we discovered that the so-called Cinderella complex widely exists in movies and novels. In the following sections, we first present our analysis on the case of Cinderella. We then scale our findings to 1327 novels, 6657 movie synopsis, and 1109 movie scripts, which is followed by a discussion on the implications and limitations of our research.

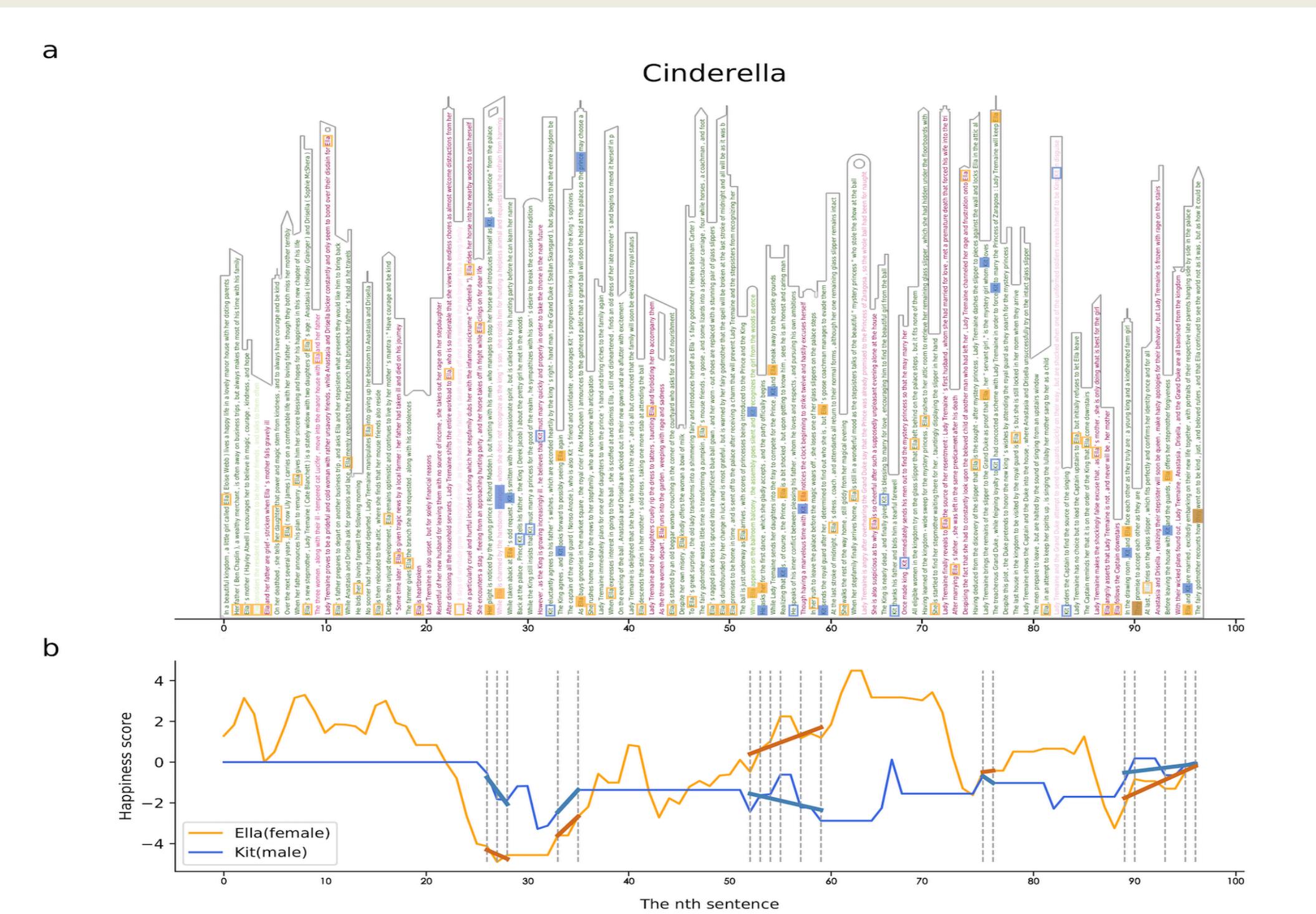


Figure 1. . The Cinderella Complex in Cinderella. a, Visualizing the movie synopsis of Cinderella. The sentences are shown in vertical style with the text colors representing happy (green) or unhappy (red). The co-occurrence of Ella (Cinderella, orange) and Kit (the prince, blue) in the same sentence is visualized by name highlighting. b, Illustration of the happiness curves for Ella (orange) and Kit (blue). The grey vertical lines marks the positions of sentences in which they co-occur. The thick lines are OLS regressions fitting the increase (or decrease) in happiness scores within successive co-occurrence.

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RESULTS

1. Cinderella Complex: Men are Women's Way to Happiness

Our analysis on the story of Cinderella supports the theory of the Cinderella Complex, which was proposed by Dowling to describe females' fear of independence and unconscious desire to be taken care of by others. In the story of Cinderella, the female protagonist Cinderella is kind-hearted, beautiful, attractive, and independent, yet still cannot decide her own destiny and has to wait for the help from others (e.g., the fairy godmother), especially the male characters (e.g., the prince).

Using the word embedding method, we calculated the happiness scores for each sentence to quantify the sentimental ups and downs of the two main characters in the story. Figure 1 demonstrates our analysis on *Cinderella*.

We select all the positive slopes in the happiness curves and find that the mean values are larger in female curves than male curves, implying the constructed emotional dependency of female roles - the co-occurrence always has the stronger effect on the happiness of female characters than male characters. Figure 2 shows that this result is robust across different types of movies and books, ruling out the possibility that the observed emotional dependency is the consequence of certain topics of stories.

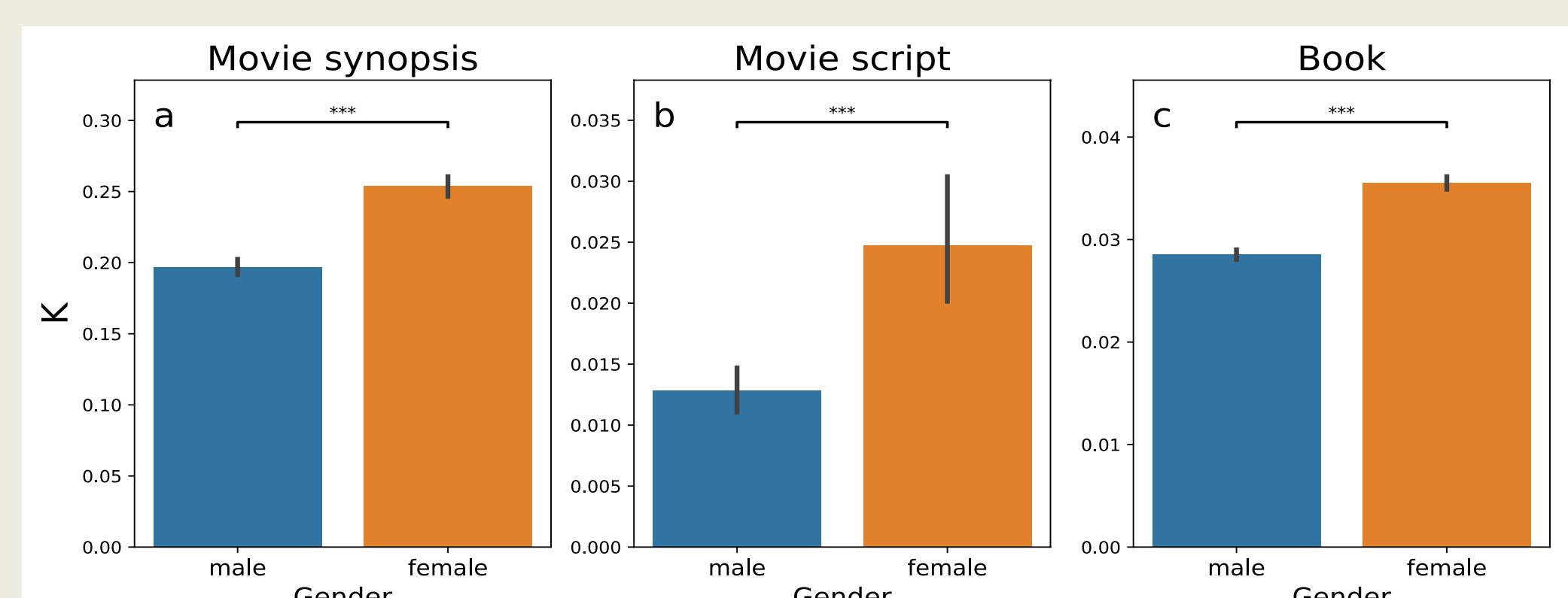


Figure 2. The increase in happiness, conditional on co-occurrence with the other gender, is higher for female than male characters.

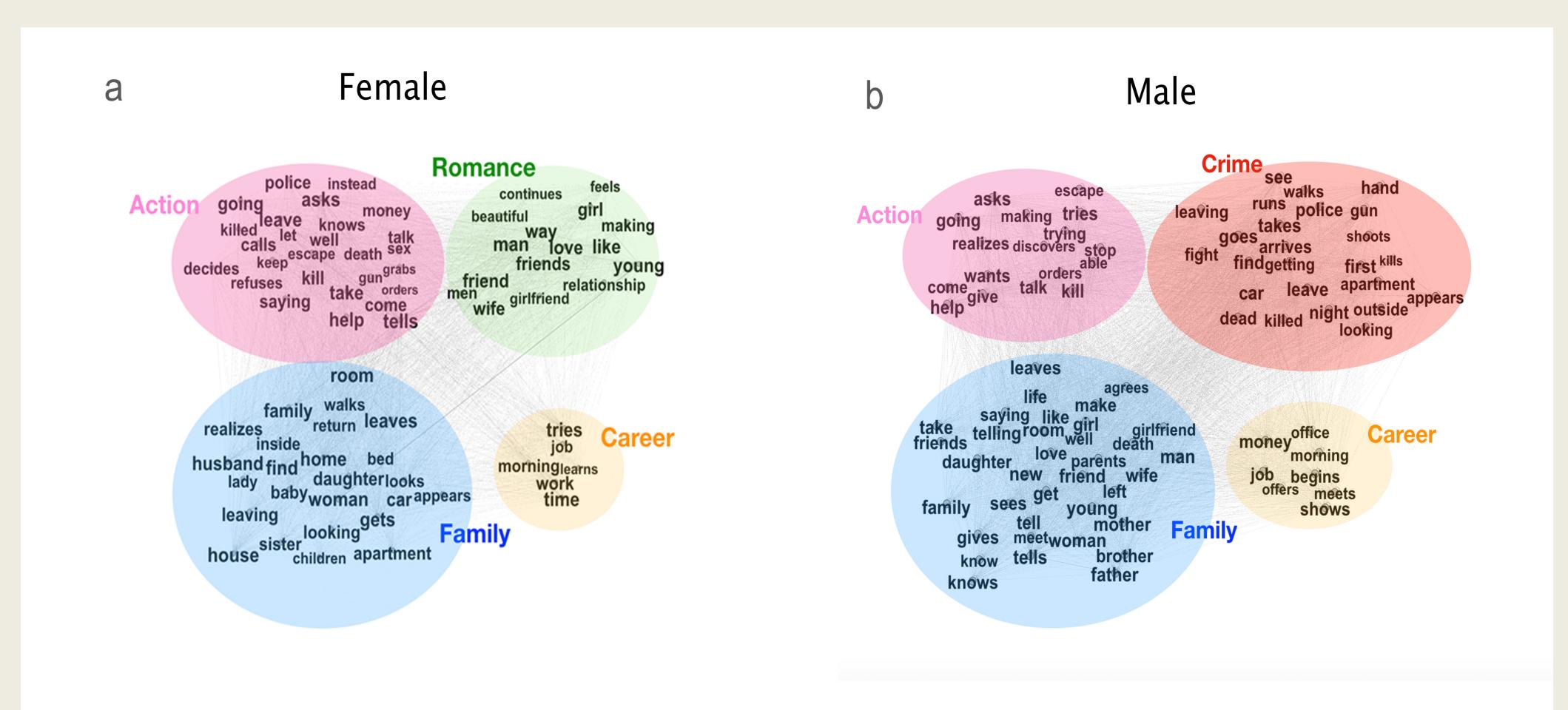


Figure 3. Word co-occurrence networks as the context of female-male character co-occurrence

2. Cinderella Complex: People's Choice

We run OLS linear regressions to explore how the emotional increase of female or male characters, conditional on the co-occurrence of the other gender role, influences the popularity (measured by the number of votes) and quality (measured by rating) of movies. We observed that the increase in female happiness associated with the co-occurrence of male characters has a positive impact on both popularity and quality, whereas the increase in male happiness has a negative impact. This finding reveals a striking fact: movies presenting the emotional vulnerability and dependency of female is more likely to be perceived as a "good story" (high rating) and will get more attention (more votes). In contrast, movies on the emotional vulnerability of male characters is unwelcomed.

3. Unpacking the Lives of Female and Male Characters

To better compare the semantic structure of male and female systems, we cut the networks into three slices of adjectives, verbs, and nouns. The differences in the distribution of words provides a new dimension to understand gender stereotypes.

CONCLUSIONS

Our study reveals the widely existence of the Cinderella Complex in stories - the emotional dependence of female characters on male characters. Our analysis starts from the anatomy of the movie synopsis of Cinderella, which is then extended to thousands of movies and books. Using word embedding techniques, we demonstrated how a gender stereotype - men are women's way to happiness, is constructed and delivered through a well-designed shape of story.

Stories are mirrors of reality and their structure reflects how our culture and collective memory is built, enhanced, and evolved. Our analysis provides insight into a principle of collective memory or attention: the complexity of events and people is reduced and compressed such that it is possible to be passed down in collective memory over generations. Our current analysis is based on the data of movies and books, but it can be easily generalized to cover all kinds of narrative that may be broadly defined as "stories", including news, history, constitution, etc.