Gender biases in animated series for children – a network analysis

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Introduction

In Albert Banduras Social-Cognitive-Theory children are learning social behaviour mostly through observation of others and the social consequences associated with it. These implications are also true when children are observing behaviour through a television program[4,6]. The occurrence of gender biases in mass media, especially in television has been well documented throughout different fields of research. Gender stereotypes are widely spread in media in general, and in TV shows for children in particular.
Often male characters outnumber female characters by 2:1[2,3]. They appear on screen more often, speak more words, ask more questions and have more questions directed towards them compared to female character [5].

Study Aim: The aim of this explorative research study was to investigate the occurrence of gender specific properties in popular animated series by analysing the corresponding transcripts using computational techniques.

Table 1: Hypotheses and applied statistical methods

Hypothesis	Research Question
H1	A difference in the sentiment-scores (s-scores) of characters expressions depending on their gender as well as that of the addressees is expected. *proc.: 2-way & 4-way ANOVA; gender_from*gender_to (2x2) & ...*role_from*role_to (2x2x4x4)*
H2	A difference in the sentiment scores of potential role models (ten most central characters by betweenness) is expected depending on the gender of the character they are talking to or the gender of the character talking to them. *proc.: 2-way ANOVA; from*to (3x3)*
H3	It is expected that the following text parameters will differ depending on the gender of the character and that of the addressees: 3a: number of characters by gender; *proc.: χ^2 Test of Independence; characters by gender (2)* 3b: number of speech prompts; *proc.: χ^2 Test of Independence; lines by Gender (2x2)* 3c: number of words spoken; *proc.: three-way ANOVA; gender_from*gender_to*wCount* 3d: number of questions; proc.: *three-way ANOVA; gender_from*gender_to*question (2x2x2)* *χ^2 Test of Independence; question by gender_from*gender_to (2x2)*

Results & Discussion

[H1] Expressions by female characters are sign. more negative in sentiment than those by males ($F(1) = [41.022]$, $p < 0.001$; Figure 2). No sign. effects in S-scores in gender groups of the addressees were observed. No interaction effect between the factors was observed either. ANOVA model-fit analysis suggested a four-way ANOVA adding role_from*role_to as additional independent variables over the described two-way ANOVA, showing sign. main effects in gender_from, role_from and role_to as well as 42 sig. interaction-effects (gender_from see above; role_from: $F(3) = [16.589]$, $p < 0.001$; role_to: $F(3) = [9.541]$, $p < 0.001$; Figures 3 and 4).

[H2] Expressions of (potential) role models, female characters and male characters differ in mean S-scores ($F(2) = [29.674]$, $p < 0.001$). Role models show the lowest S-scores, followed by females and males (Figure 5). No significant effects in S-scores in the addressees groups were observed, as well as no interaction-effect between the factors was observed either.

[H3] The number of characters by gender differ significantly overall as well as by season with the number of male characters being higher (χ^2 (NA, N = 371) = 4.6881, $p < 0.05$, see also plot B in Figure 6). The differences in speech prompts (spoken lines) grouped by gender are sign. between groups (χ^2 (NA, N = 19895) = 177.63, $p < 0.001$). Female characters speak more lines than males. When adding character roles - again all groups differ significantly (χ^2 (2, N = 19895) = 728.99, $p < 0.001$; Table 3). The number of questions asked as well as received by gender differ in all groups. Female characters are asking more questions and are getting asked more questions than males do (see Table 4). A three-way ANOVA adding the factor Question an independent variable to gender_from, gender_to shows no sign. effects except those those already reported above (gender_from). No main- or interaction-effects (gender_from, gender_to) in number of words per line were observed in S-scores, Frequency are shown in Table 2 for reasons of completeness.

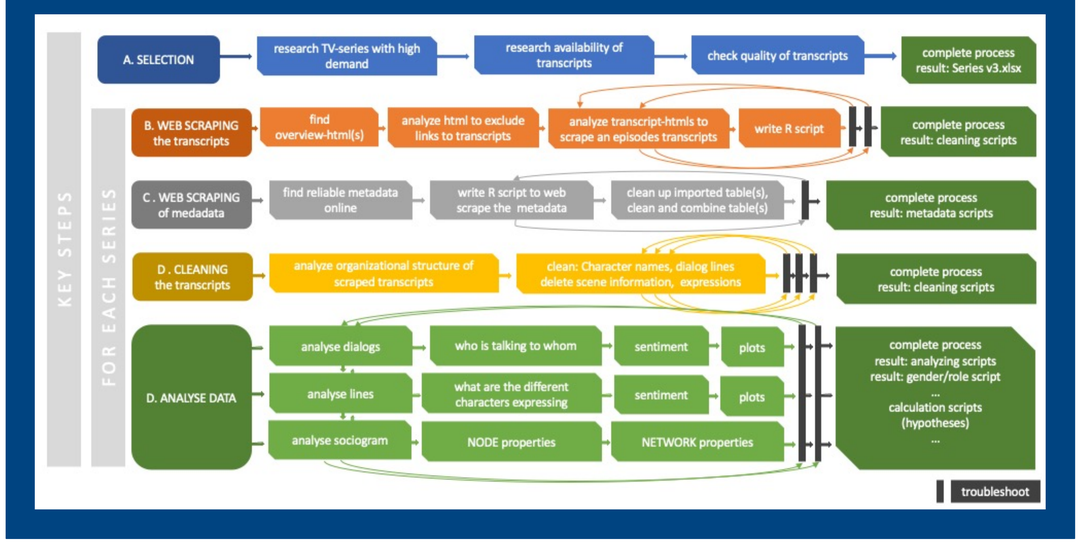
[Overall] Mean group S-scores are negative in all generated subgroups (gender, role, role category).

Conclusion

Computational analysis of social structures in TV series can be carried out based on the dialogs within a series. The informative value of the analysis crucially depends on the quality of the transcripts.

The results of the study in terms of possible gender bias are limited to one animated series only and would need to be extended to a variety of series to increase the generality of conclusions.

Figure 1: Research process workflow incl. step descriptions and resulting workflow artifacts.



Methods

Sample: 131 open-source transcripts of the animated series "Miraculous: Tales of Ladybug & Cat Noir" by Zagtoon, 27 transcripts had to be excluded, so 104 were analysed.

Processing and calculation: After web-scrapping the data and a complex cleaning process, sentiment analysis was performed per paragraph using sentiment.ai[9]. The steps of transcript processing are shown in detail in Figure 1. Since the sentiment data was not normally distributed, it was z-transformed before further analyses. Graph-characteristics were used to examine social properties within the series[1]. Table 1 lists the study hypotheses and the calculation methods used. All computations were conduced exclusively using R Studio (2022.02.1 Build 46) and selected packages[7,8,9].

Fig. 2: [H1a] Violin plot of S-scores - gender_from

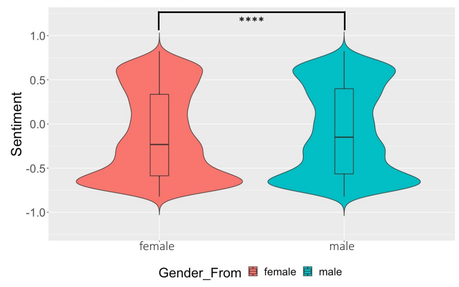


Fig. 3: [H1b] Violin plot of S-scores - role_from

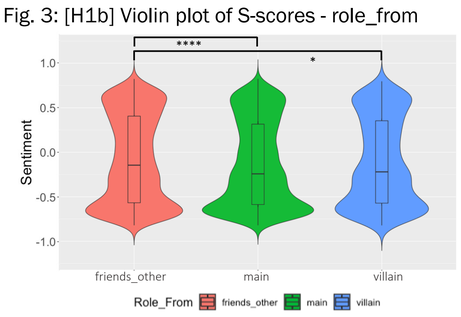


Fig. 4: [H1b] Violin plot of S-scores - role_to

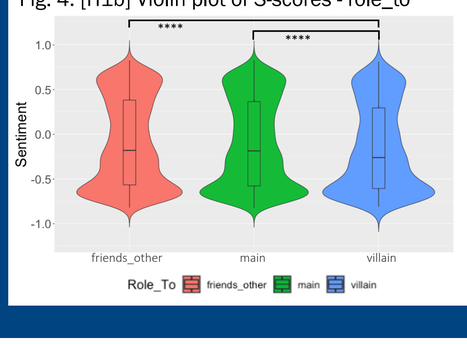
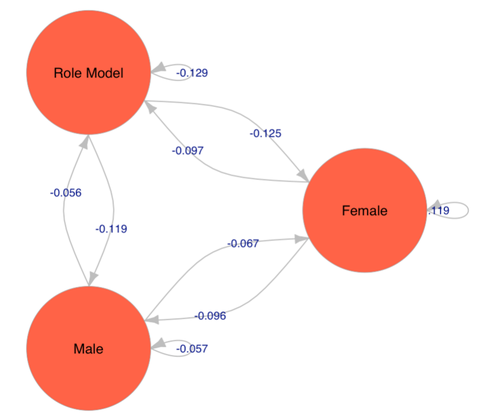


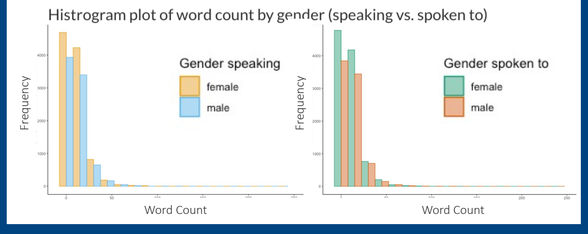
Fig. 5: [H2] S-scores – pot. role models and gender



Tab. 2: [H3c] Words

Words *not sign. quoted for completeness

Histrogram plot of word count by gender (speaking vs. spoken to)



Tab. 3: [H3b]: Speech Prompts (spoken lines)

Speech Prompts

Number of lines by gender*role

	ROLE		
	FRIENDS_OTHER	MAIN	VILLAIN
GENDER			
FEMALE	4631	5584	750
MALE	4099	3248	1560

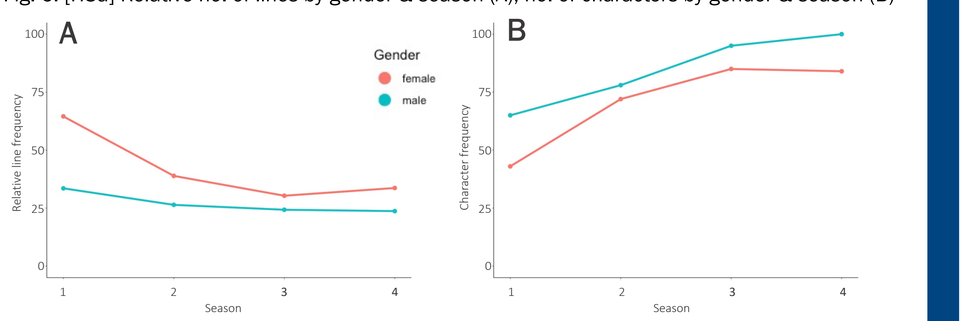
Tab. 4: [H3d]: Questions

Questions

Number of questions asked/received by gender

	QUESTION RECEIVED	
	TOWARDS FEMALE	TOWARDS MALE
QUESTION ASKED		
BY FEMALE	5123	4897
BY MALE	4890	3330

Fig. 6: [H3a] Relative no. of lines by gender & season (A), no. of characters by gender & season (B)



**** p > 0.0001 *** p > 0.001 ** p > 0.01 * p > 0.05

References

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