Evaluating Sci-fi Readers' Perspective: Correlation between Immersive Emotion and Speculative Factors

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Abstract

The narrative experience in stories influences subsequent beliefs related to it but no quantitative research has been conducted in the sci-fi genre. Therefore, this study identified factors for the quantitative evaluation of the narrative experience of science fiction (sci-fi). Data on sci-fi readers were collected using a questionnaire survey in 2022. The questionnaire items were developed based on the narrative engagement scale and sci-fi studies. The scale explains factors consisting of the narrative experience that novels bring to readers. A total of 978 samples were statistically analyzed using exploratory factor analysis. As a result, three latent constructs were found: "comprehension," "immersion," and "speculation," which is a specific factor in sci-fi. Next, a correlation analysis was performed for the three constructs. The results showed that the correlation between immersion and speculation was higher than any other correlation. The study's findings such as: (1) the narrative engagement scales could be applied to sci-fi evaluation, (2) the identification of an evaluation factor unique to the narrative experience of sci-fi "speculation" and (3) clarification of the relationship between the emotional immersive factor and speculation factor, suggests that the influence of sci-fi on immersive emotion changes the future perspective of readers.

Keywords: cognitive value, evaluation factors of science fiction, narrative engagement scale, science fiction prototyping.

1 Introduction

This study reveals factors in the evaluation of the narrative experience of science fiction (sci-fi). The narrative experience of stories is important because it has been reported that the extent of immersion or engagement of a story influences subsequent attitudes and beliefs related to the stories [1][2][3][4][5]. Therefore, clarifying the relationship between cognitive understanding and emotional responses in the narrative experience is important [1].

Additionally, a need for the quantitative investigation of the narrative experience has been specified, and a narrative engagement scale has been developed [1]. However, to the best of our

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knowledge, little quantitative research has been conducted in the sci-fi genre except for the comparative study of sci-fi and sci-fi prototyping [6], and no evaluation index has been developed. Thus, a quantitative survey was conducted in this study, and factors for evaluating the narrative experience of sci-fi were identified.

In the survey, questionnaires were developed based on the narrative engagement scale and sci-fi studies. Data were collected in 2022 using the questionnaires and a total of 978 samples were analyzed [1]. This scale consists of four dimensions—narrative understanding, attentional focus, emotional engagement, and narrative presence—all of which measure the influence on narrative experience.

The narrative engagement scale was developed based on experiments conducted to measure readers' responses to and involvement in the stories (narrative engagement) [1]. The scale has even been used in recent studies [7][8]. However, in terms of genres (e.g., sci-fi), which have a specific purpose, there is no empirical research on the factors of the narrative experience and the relationship among them, which this study examines.

In particular, the research of Busselle and Bilandzic [1] excluded sci-fi works. Moreover, sci-fi research from literary studies and cognitive poetics [9][10][11][12][13] has not been quantitatively investigated. Additionally, these studies were qualitative and theoretical, and evaluation criteria have not yet been created for sci-fi stories. To fill this gap, this study set the following research questions (RQ):

RQ1: Can the narrative engagement scales be applied to sci-fi stories?

RQ2: What factors are unique to the narrative experience of sci-fi?

RQ3: What is the relationship between the factors?

To answer them, evaluation items of narrative experience of sci-fi based on Suvin [9][10][11] were developed and included in the questionnaire survey with the narrative engagement scales [1]. That is, the items for evaluating the narrative experience of sci-fi were developed based on sci-fi studies that offer theories on the peculiar cognitive value of sci-fi—the value that gives insight into society and human beings and is often emphasized in sci-fi studies [9][10][11], to add an evaluation unique to sci-fi.

As a result of the analysis, the evaluation factors of narrative experience for stories that were developed by Busselle and Bilandzic [1] could be applied to sci-fi as well, and the factors related to the narrative engagement scale were found. Additionally, an evaluation factor unique to the narrative experience for sci-fi was identified. Besides clarifying the relationship between cognitive understanding and emotional responses in sci-fi [1], the relationship between the factors related to them was examined.

2   Method

2.1   Participants

The current study adopted a quantitative analysis using a questionnaire survey and was conducted online in January 2022. Five sci-fi stories (text) were prepared, and the participants read the stories and responded to the questionnaire.

A total of 1,318 Japanese native speakers participated in the online survey via Lancers, a Japanese online working system, and 1,000 participants completed all the items. All the participants were given 500 yen as a reward. Data from participants whose total reading time was three *SD* shorter than the mean reading time of each text were excluded from the analysis because they

were regarded as outliers with respect to reading time. As a result, data from 978 participants were included in the analysis.

2.2 Measures

The questionnaire was composed of 18 question items that were formulated based on the narrative engagement scale [1] and sci-fi studies [9][10][11]. Seven dimensions were included (Table 1), among which four were formulated based on the narrative engagement scale [1]: "narrative understanding," "attentional focus," "emotional engagement," and "narrative presence" (No. 1 to 12 in Table 1) [1]. Three dimensions were newly added to evaluate the value of sci-fi: "goodness for sci-fi," "sci-fi feature," and "sci-fi cognitive value" (No. 13 to 18 in Table 1) [9][10][11].

Table 1: Questionnaire items, their associated variables, and labels

No	Questionnaire items	Variables	Labels
1	Sometimes it was hard to understand what was going on in the sci-fi story.	narrative understanding_1	CON1
2	I didn't understand the personas very well.	narrative understanding_2	CON2
3	I sometimes lost track of the plot of this sci-fi.	narrative understanding_3	CON3
4	My mind was wandering while I was reading.	attentional focus_1	AWE1
5	While I was reading the sci-fi story, I was thinking about other things.	attentional focus_2	AWE2
6	While I was reading the sci-fi story, I had a hard time focusing on reading.	attentional focus_3	AWE3
7	The story affected me emotionally.	emotional engagement_1	SYM1
8	While I was reading, I felt happy, when the main characters succeeded; I felt sad when they suffered in some way.	emotional engagement_2	SYM2
9	While I was reading sci-fi, I empathized with a character.	emotional engagement_3	SYM3

10	While I was reading, my body was in the room, but my mind was inside the world created by the story.	narrative presence_1	NAP1
11	The sci-fi story created a new world, which suddenly disappeared when it ended.	narrative presence_2	NAP2
12	Sometimes, the story world was closer to me than the real world.	narrative presence_3	NAP3
13	After reading the sci-fi story, I thought that the rules and values of the real world that I had believed in were not the only absolute ones.	goodness for sci-fi_1	GSF1
14	After reading the sci-fi story, I felt that having a different society from ours is possible.	goodness for sci-fi_2	GSF2
15	Modern technologies and mechanisms that appear in sci-fi consistently support the sci-fi plot deployment.	sci-fi feature_1	FSF1
16	The deployment of the sci-fi story is plausible.	sci-fi feature_2	FSF2
17	Reading sci-fi gave me a new perspective.	sci-fi cognitive value_1	SOW1
18	Reading sci-fi made me think of social problems in the real world.	sci-fi cognitive value_2	SOW2

2.3 Materials

We used five sci-fi texts that were created using the science fiction prototyping method, re-written by sci-fi authors [14][15][16][17][18]. The science fiction prototyping method cre-ates sci-fi as an output for creative future vision in group work [19][20][21]. The method is unique because it differs from roadmapping-based group work [22] in that it uses fiction stories. The sci-fi texts were written in Japanese, and permission to use them was obtained from each author and publisher.

2.4 Procedure

The current study was conducted through an online survey. After the purpose of the study was explained to the participants and their permission was obtained, the native languages of the participants were checked so that only Japanese native speakers could participate in the survey. One of the five sci-fi texts was randomly assigned to each participant and was presented so that each page had about a thousand letters. The participants were asked to complete the reading in about 30 minutes. They were, however, allowed to exceed 30 minutes should they need to. The reading time per page was recorded. After reading the text, the participants were asked to answer 50 items concerning the text on a 5-point Likert scale and to provide their demographic information: gender, age, occupation, education do-main, educational attainment, reading time per month, and reading time of creative work per month. As previously mentioned, 18 items among the 50 items were used for the cur-rent study because they aligned with the purpose of this research; the remaining items were collected for other purposes of studies.

2.5 Analysis Method

An exploratory factor analysis (EFA) by the maximum likelihood method with the Promax rotation was adopted to determine the underlying unobservable relationships between measured variables, the so-called latent constructs [23]. Sampling adequacy was measured using Kaiser–Meyer–Olkin (KMO), and fitness to EFA was examined by Bartlett's test of sphericity. Commonalities were also examined to confirm the validity of EFA. Variables CON1 to 3 and AWE1 to 3 were reversed questions that were inversed and analyzed. Cor-relation analysis was also conducted to examine the relationship between the constructs.

3   Results

3.1   Explanatory Factor Analysis (EFA)

EFA was conducted for the variables listed in Table 2, which presents the result of the pattern matrix of EFA showing factor loadings for each factor from the EFA result. Since no factor loading was greater than 0.9, there was no multicollinearity. The results also showed no factor loadings less than 0.3, which means that they had a high explanation. The result of KMO was 0.904, which was large enough for EFA. Bartlett's Test of Sphericity was significant at less than 0.1% level, which showed good fitness for EFA. The figures of the commonalities were above 0.16 for all variables. It also showed the validity of EFA.

From the result, EFA1, EFA2, and EFA3 constructs were named "comprehension," "immer-sion," and "speculation," respectively, based on each construct's variables. The comprehension construct includes variables related to the readers' cognitive understanding of sci-fi. The immer-sion construct includes variables related to the readers' emotional attributes toward sci-fi. The speculation construct includes variables related to the readers' perspective changes in the future.

EFA1 and EFA2 are the results of the analysis of a questionnaire based on the narrative in-volvement scale [1], and EFA3 is the result of the analysis of a questionnaire based on sci-fi studies [9][10][11]. EFA3 is a novel factor that has not been specified before.

Table 2: Pattern Matrix as a result of EFA

Construct	Labels	Factor		
		1	**2**	**3**
EFA1 Comprehension (Factor related to readers' cognitive understanding of sci-fi)	AWE1	0.887	0.019	-0.021
	AWE3	0.865	0.014	0.003
	AWE2	0.764	-0.015	-0.005
	CON3	0.681	-0.034	0.041
	CON2	0.605	0.032	0.063
	CON1	0.546	-0.043	-0.067
EFA2 Immersion (Factor related to readers' emotional attributes toward sci-fi)	SYN2	0.000	0.792	-0.061
	NAP1	0.073	0.761	-0.052
	SYN1	0.049	0.670	0.095
	SYN3	-0.021	0.667	0.075
	NAP2	-0.134	0.627	0.009
	NAP3	0.040	0.619	0.055
EFA3 Speculation (Factor related to the change in readers' future perspective)	GSF2	-0.001	-0.172	0.845
	SOW1	-0.038	0.133	0.655
	GSF1	-0.107	0.113	0.607
	SOW2	-0.074	0.201	0.510
	FSF1	0.171	-0.001	0.457
	FSF2	0.127	0.105	0.439

Extraction method: maximum likelihood.

Rotation method: Promax with Kaiser normalization. A. Rotation converged in 4 iterations.

3.2 Correlation Analysis between the Constructs

The scatter charts and Table 3 show the results of the correlation analysis between the latent constructs, EFA1 to 3 (Figure 1, Table 3). The results showed that the correlation between EFA2 and EFA3 was higher than any other correlation. A somewhat weak correlation between EFA1 and EFA2 was found. A weak correlation was found between EFA1 and EFA3. The immersion construct (EFA2), which is an emotion-related factor, and the speculation construct (EFA3), which is a future perspective factor, also show relations. The result presented the influence of sci-fi on immersive emotion related to a new perspective and on considering social problems in the real world. It is presumably understandable that the comprehension and immersion constructs (EFA1 and EFA2, respectively) have a relationship. This shows that if the readers can understand the story, they tend to be immersed in it.

Table 3: Factor Correlation Matrix for the latent constructs

	EFA1	EFA2	EFA3
EFA1	1.000	0.399	0.251
EFA2	0.399	1.000	0.693
EFA3	0.251	0.693	1.000

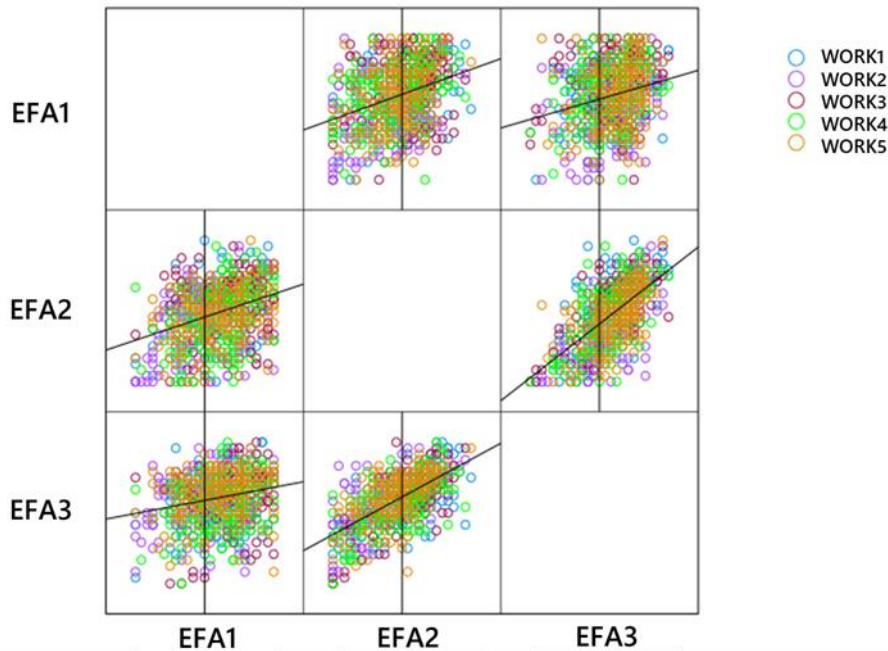Extraction method: maximum likelihood. Rotation method: Promax with Kaiser normalization.

Figure 1: Correlation analysis between the latent constructs

4   Discussion

First, this study revealed that sci-fi works have the same level of influential factors on the narrative experience that Busselle and Bilandzic developed for general fiction works [1]. That is, even in sci-fi works, narrative understanding, attention focus, emotional engagement, and narrative presence—factors in the narrative engagement scale—were experienced in the same way as in the case of general novels. Therefore, the narrative engagement scale could be applied to sci-fi evaluation.

Second, a newly created "speculation" factor (EFA3) includes variables such as "goodness for sci-fi (GSFx)," which includes a diversified perspective, "sci-fi feature (FSFx)," which includes coherence within science fiction stories, and "sci-fi cognitive value (SOWx)," which includes a perspective change in the real world and the future. The result indicated that these characteristics are unique to sci-fi works, as specified by Suvin [9][10][11], who discussed the value of sci-fi. Thus, an evaluation factor unique to narrative experience for sci-fi was identified. The "speculation" factor is described in detail below.

According to Suvin, the unique characteristics of sci-fi works are the schemes that present the possibility of a reality other than the one that is actualized in the present by depicting the possibilities of a future society different from the present one, as well as new norms of reality [9][10][11]. In other words, sci-fi which has characteristics of sci-fi that Suvin mentioned, allows the reader to imagine the possibility of being in a society that is different from today's society. This idea corresponds to the questionnaire items—"After reading the sci-fi story, I thought that the rules and values of the real world that I had believed in were not the only absolute ones," (GSF1), and "After reading this sci-fi story, I felt that having a different society from ours is possible" (GSF2). These items constitute the EFA3 speculation factor.

Additionally, the speculation factor brings a new social understanding to the readers through its "newly acquired perspective" and invites them to consider social issues in the real world [9][10][11]. This corresponds to the questionnaire items—"Reading this sci-fi story gave me a new perspective" (SOW1), and "Reading this sci-fi story made me think of social problems in the real world" (SOW2). These items constitute the EFA3 speculation factor.

Suvin noted that imagining these alternative societies is facilitated by the coherent and plausible storyline enhanced by the technology of "new events (novum)" depicted in the sci-fi work [9][10][11]. This corresponds to the questionnaire items—"Modern technologies and mechanisms that appear in sci-fi consistently support the sci-fi plot deployment" (FSF1), and "The deployment of the sci-fi story is plausible" (FSF2). These items constitute the EFA3 speculation factor.

Suvin's assertion has been discussed in literary theory and philosophy, though it has not been quantitatively studied. However, this study revealed the unique characteristics of sci-fi that Suvin specified.

Finally, the relationship between factors in the narrative experience of sci-fi was clarified. The correlation between immersion (EFA2) and speculation (EFA3) showed that the emotional immersion factor was related to a change in values and a new perspective on the world [9][10][11], which is a typical feature of sci-fi. In other words, emotional connection and immersion are also found to be important for "science fiction-ness." Sci-fi depicts new technologies and institutions, develops a coherent and plausible narrative, and offers "cognitive value" that provides new social understanding to readers and asks them to consider social issues in the real world. It was clarified that such "science fiction-ness" has a relationship to emotional immersion. This point has not been discussed explicitly in sci-fi studies so far. The relationship between emotional immersion and speculation in sci-fi changes readers' perspectives about the future.

Clarifying factors for evaluating the narrative experience of sci-fi is quite important because it has been reported that the extent of immersion or engagement in a story influences subsequent attitudes and beliefs related to the story [1][2][3][4][5]. This study explored the relationship between immersion and speculation factors, which influences readers' attitudes and beliefs when presented in sci-fi works.

The relatively weak correlation between EFA1 and EFA3 showed that comprehension and speculation have a certain degree of relation, indicating that clarity and the ability to attract attention have a positive impact, albeit weak, on sci-fi-ness and cognitive value. Even though the correlation between EFA1 and EFA3 was weak in this study, the clarification of the impact on the reader's narrative experience could be an important guideline for the production of sci-fi works.

The five sci-fi works used in this analysis were created using the sci-fi prototyping method and rewritten by sci-fi authors. These sci-fi works to provide readers with the power of imagination to envision the services and products of the future [20][21]. In order to perform this function, works that are difficult to understand or distract the readers' attention should be avoided, and ways to enhance emotional empathy and presence should be provided when creating works using the sci-fi prototyping method.

The effect of the sci-fi prototyping method has been presented as a cognitive value of the characteristics of stories in general [24]. However, given these findings, the specific value of the prototyping method is that the work is not only attractive as a story, but it invites readers to bring new social understandings to consider social issues in the real world. The expectation is that it will lead the readers to imagine different possibilities of reality.

5   Conclusion

In this study, a quantitative survey was conducted and the factors that could be used to evaluate the narrative experience of sci-fi were identified. The questionnaire survey was conducted and analyzed by EFA and correlation analysis. As a result of the analysis, the academic contributions, reflected in the answers to the research questions, are as follows:

As an answer to RQ1, the narrative engagement scales, which were originally used for fiction, could be applied to sci-fi evaluation.

As an answer to RQ2, an evaluation factor unique to the narrative experience of sci-fi was identified—that is, speculation construct.

As an answer to RQ3, the relationship between the emotional immersion and speculation factors was clarified.

This study contributes to academia with three major findings. Specifically, this study showed that the emotional immersion provided by sci-fi gives a new social understanding to readers and encourages them to consider social issues in the real world to bring about a change in values, and offer a new perspective on the world. As a practical contribution, this study presented an important guideline for the production of sci-fi works by creators and authors by clarifying their impact on sci-fi readers' narrative experience.

In the future, additional research is required on sci-fi stories that are not created using the sci-fi prototyping method to apply the evaluation factors found in this study. Additionally, further research is needed to apply the evaluation factors to more sci-fi works. The results of the current study are based on a survey of five sci-fi stories and are thus limited by subject selection and time constraints. Situations beyond the scope of these settings may occur.

Acknowledgments

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