

Emotional Impact of Interactivity: Falling Girl as a Case Study

Sona Research Technical Report

**Peiyi Ko and Scott Snibbe
September 15, 2008**

Objectives

This study aims to answer the following questions about an interactive art installation: Does the emotional impact of the installation on the viewers differ depending on whether it is interactive or not? The effect of social circumstances, measured by the number of the viewer(s) on the emotional impact and the duration of engagement is also assessed.

Methodology

Surveys were conducted on the viewers of Falling Girl, an interactive media installation about eight minutes long, during its exhibition at the Berkeley Arts Museum. There were two experimental conditions, interactive and non-interactive, carried out on two different days from 11:30am to 4:30pm. In the interactive condition (the normal setting of the piece), an infrared camera captured the silhouettes of viewers against a reflective screen, inserting them into the windows in the scene, and making the viewers a part of the narrative in real time during two temporal windows of interactivity; in the non-interactive condition, the screen was covered with non-reflective paper and the viewers could not interact with the narrative because their actions were not recorded nor projected. The piece was therefore perceived more like a movie.

Visitors to the museum on each day were approached to give consent and participate in the study after they finished viewing the work. The duration of engagement (holding time) was recorded before they were approached. Some subjects requested to return to the work after being asked to participate because they were not very engaged the first time. In this case, the holding times were summed. The sample size for the interactive and non-interactive conditions was 11 and 16 respectively. The questionnaire is attached at the end of the document.

In addition to descriptive emotional responses, we attempted to quantify subjective ratings of emotional responses along the three dimensions of emotion¹, pleasantness-unpleasantness, level of activation, and level of aggression, using the visual analog scales self-report method. The subjects placed the marks on a line scale according to their preference differences between two bipolar verbal anchors at the ends². The distance from the left end of the scale was used for analysis. Holding time, the amount of time the visitors spent with the installation observed by the experimenter, was used as an indicator of the enticement experienced by the viewers and was compared between interactive and non-interactive conditions. Statistical testing was performed in Matlab: Mann-Whitney Rank-Sum U Test was used to compare the visual analog scales ratings of three dimensions of emotion, t-test was used to compare the holding time as a continuous

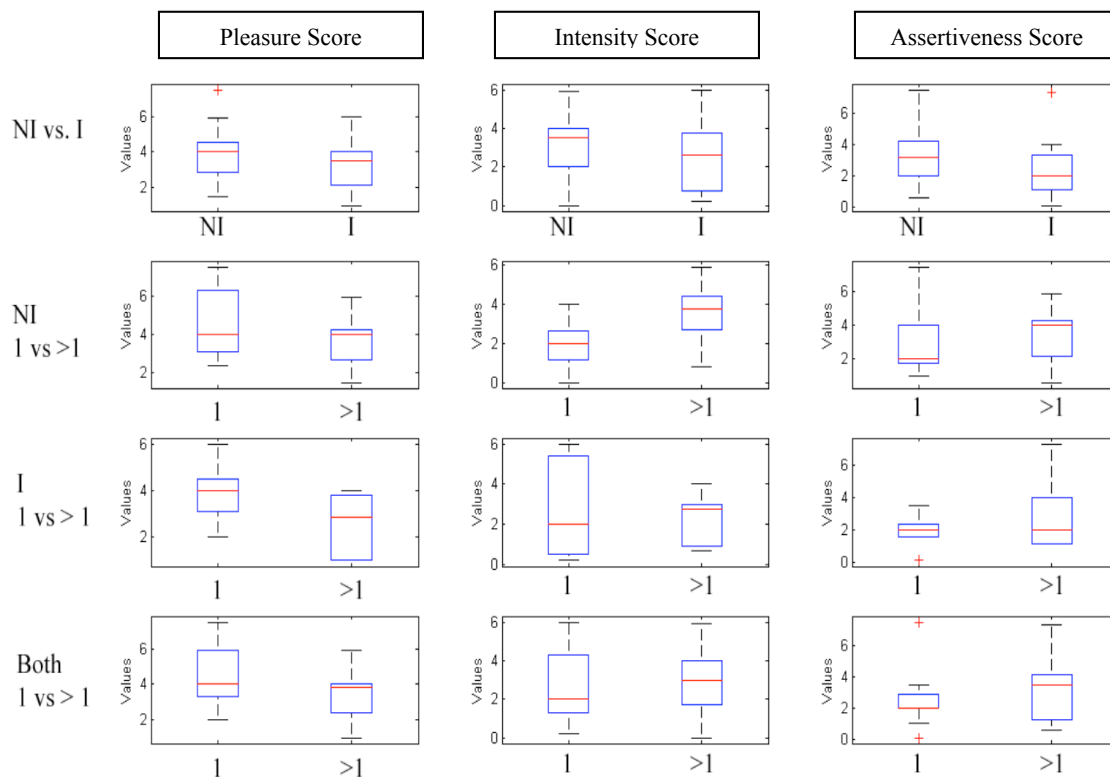
outcome measurement, Fisher Exact Test and Chi-square Test were used to analyze the categorical data.

Results

The subjects' ages range from 17-70 with interactive group mean = 43 and non-interactive group mean = 30. Female to male ratio within each group is essentially 1:1. There are more students in the non-interactive group.

A. Subjective rating across conditions (Box plots and Mann-Whitney Rank-Sum U Test)

Figure 1: There are no significant effect of interactivity and number of viewers found on either the pleasantness, intensity, or assertiveness scores. P-values are provided in the table (NI: Non-Interactive; I: Interactive; 1: only 1 person; >1: more than one person).

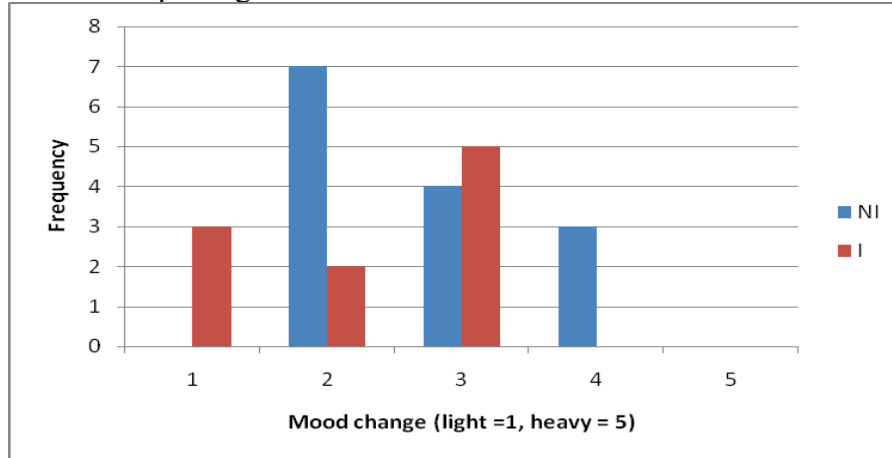


	Pleasure (Pleasantness-Unpleasantness)	Intensity (Level of Activation)	Assertiveness (Level of Aggression)
NI vs I	0.18	0.48	0.18
NI: 1 vs >1	0.56	0.45	0.49
I: 1 vs >1	0.16	0.93	0.75
Both: 1 vs >1	0.27	0.57	0.26

B. Mood Change (Chi Square Test)

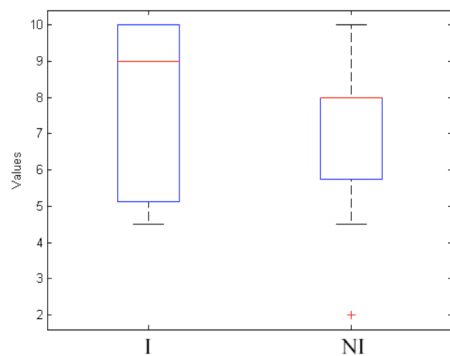
Figure 2: There is a significant difference in the mood change after viewing the piece

between the non-interactive (NI) and the interactive (I) ($p < 0.05$). Interactive group tended to report lighter mood.

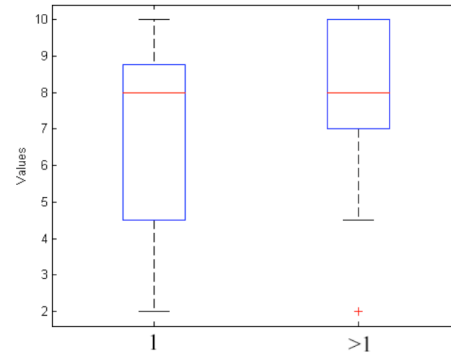


C. Holding time across conditions (Box plots and t-test)

Figure 3: There is no significant effect of interactivity and number of viewers found on the holding time (NI: Non-Interactive; I: Interactive; 1: only 1 person; >1: more than one person).



$p = 0.11$



$p = 0.86$

D. Other potential indicators for emotional impact of the piece (Fisher Exact Test)

Table 1: There is no significant difference in the Yes/No (Y/N) response between the non-interactive (NI) and the interactive (I) (Q# Refer to the question number in the survey).

Q4: Physical or Visceral feelings			
	Y	N	row total
NI	6	10	16
I	6	4	10
column total	12	14	26

$p = 0.1741$

Q7: See a story in the work			
	Y	N	row total
NI	12	4	16
I	8	3	11
column total	20	7	27

$p = 0.3382$

Q7: Feel for the girl			
	Y	N	row total
NI	4	8	12
I	4	4	8
column total	8	12	20

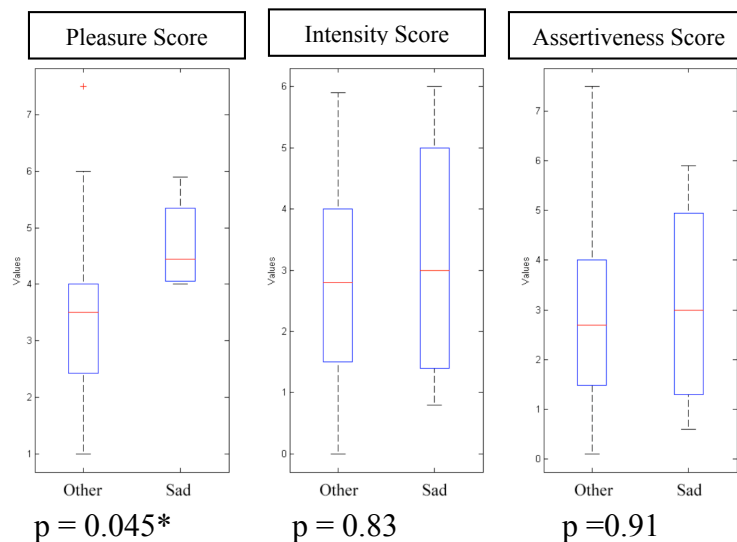
p = 0.2751

Q7: Feel being part of the story			
	Y	N	row total
NI	9	3	12
I	5	3	8
column total	14	6	20

p = 0.3179

Discussions

Using the five-category scale, we found that viewers felt their moods were lighter after visited the installation under interactive condition. However, these changes cannot be detected along three dimensions of emotion; this result may not be conclusive because of the small sample size for each condition. To verify this is not a flawed in experimental design, we asked whether the methodology can detect any significance difference. To test this idea, we compared the emotional ratings of four subjects who chose the emotional word, “sad,” which has the highest occurrence rate in the study, to describe their feelings after viewing the piece to the rest of the subjects. We detect a significant difference using the Mann-Whitney Rank-Sum U Test in the pleasure dimension, which is expected, since sadness is a well-recognized unpleasant emotion. After transforming the mean the same way as the study done by Russell and Mehrabian (1997)³, the sign of the value (negative on the pleasure dimension of emotion) also agree with what they have found for “sad”.



References

1. Bush, L.E., 2nd. Individual differences multidimensional scaling of adjectives denoting feelings. *Journal of personality and social psychology* **25**, 50-57 (1973).
2. Torrance, G.W., Feeny, D. & Furlong, W. Visual analog scales: do they have a role in the measurement of preferences for health states? *Med Decis Making* **21**, 329-334 (2001).
3. Russell, J.A., Mehrabian, A. Evidence for a three-factor theory of emotions. *J Res Pers* **11**, 273-294 (1977).

Raw Data

Subject ID	Pleasure Rating	Intensity Rating	Assertiveness Rating	# Viewer(s) during visit	Holding Time (min)
NI1	2	0	2	2	2
NI2	2.4	2.2	1	1	8
NI3	4.3	3.5	3.5	2	2
NI4	3.2	4.9	1.3	2	7
NI5	1.5	4	4	2	8
NI6	4	3.5	4.4	2	8
NI7	4	4.4	4.4	2	7
NI8	4	5.9	4	2	7
NI9	4	2	2	1	4.5
NI10	2.5	2.7	2.7	2	10
NI11*	4.8	0.8	0.6	2	10
NI12*	5.9	4	5.9	3	8
NI13	7.5		7.5	1	2
NI14	5.9	4	2	1	8
NI15*	4.1	2	4	2	8
NI16	3.3	1.5	2.9	1	8
I1*	4	6	2	1	10
I2	4	2	2	1	7
I3	3.5	5.2	3.5	1	9
I4	1	0.7	1.1	3	8
I5	4	4	7.3	2	10
I6	3.8	3	4	2	10
I7	3.2	0.9	1.1	2	10
I8	2	0.6	2	1	4.5
I9	1	2.9	1.2	2	4.5
I10	2.5	2.6	2.8	2	4.5
I11	6	0.2	0.1	1	10

*Subjects used “sad” as one of the descriptive words for their emotion