

Multi-layered and multidimensional structure explaining impressions of hug scenes

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Abstract: The overall evaluation of audio-visual content pertains to viewers' affective experiences while watching them. We investigated these experiences and their mutual relationships by using scenes from movies with hug scenes. We selected 36 adjectives to describe the impressions of the videos and classified them into three layers: psychophysical, affective, and evaluative, based on a user study involving seven participants. They scored each of the 24 videos containing hug scenes according to these adjectives. The connections between the three layers were computed based on the scores of the adjectives. The four psychophysical factors influenced the four affective factors, which determined two overall evaluation factors: joyful and reassuring. The results will help develop strategies to enhance viewers' emotional experiences while watching emotional video scenes and the criteria for evaluating emotional intensities.

Keywords: *Psychophysical, Emotional, Evaluative*

1. INTRODUCTION

Emotional experiences during various activities, such as viewing videos, reading, travelling, and playing sports, have a significant impact on the judgment of their values [1]. Analyzing the components of emotional experiences is helpful for understanding the judgments and determining measures to enhance emotional experiences. This may also lead to the development of a criterion for evaluating these emotional experiences. Considering the ease of experimentation and generality of the stimuli, this study analyzed human responses to psychophysical, affective, and preferential questionnaire items while viewing emotional scenes where humans are hugging.

Many previous studies have decomposed the satisfaction or overall evaluation of emotionally appealing stimuli into multiple affective factors [1, 2] while others have attempted to predict affective experiences from the psychophysical aspects of the stimuli [3, 4, 5]. The former identifies the components of overall satisfaction, but does not aim to provide guidelines for designing stimuli with higher satisfaction. The latter directly provides such guidelines, but does not seek to facilitate an understanding of the components that form the overall evaluation.

We collected subjective evaluations of hug scenes regarding attributes, including overall-evaluative, affective, and psychophysical aspects. Participants evaluated each video containing a hug scene in terms of these aspects. In addition, they classified evaluation

attributes into three layers based on their meanings. The three layers were overall-evaluative, affective, and psychophysical factors [6]. We then determined the structure of these factors. Our findings are expected to provide a better understanding of emotionally appealing videos and the guidelines for their evaluation.

The study was approved by Institutional Review Board, Hino Campus, Tokyo Metropolitan University (22-014).

2. Methods

2.1 Participants

Seven university students and lecturers participated in the experiment after providing written informed consent.

2.2 Stimuli: Videos of hugging scenes

Twenty-four videos, ranging from 4 s to 23 s in length, were selected by the authors and their collaborators based on the following criteria: Videos, including hugging scenes between two people or between a human and an animal, were collected from online video sites. Various hugging scenes were selected, but videos with similar scenes were not included in the final video set. Furthermore, videos featuring one or two of the four types of emotions, that is, pleasantness, unpleasantness, arousal, and sleepiness that form the Russell's circumplex model were included.

2.3 Adjective attributes used to evaluate hugging

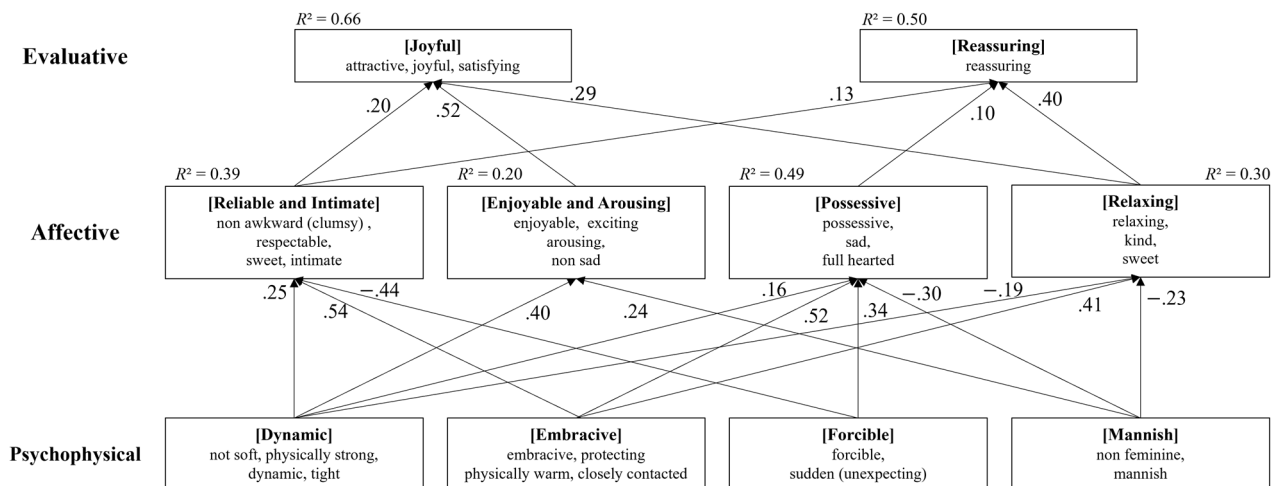


Figure 1: Three-layered structure of impressions toward hug scenes. The values nearby the arrows are the coefficients to determine the magnitudes of influences from the lower layer.

scenes

Fifty-nine words from the websites relating to hugs that were searched using search engines were selected as evaluation words for hugging. Selected words that were not adjectives were converted into adjectives. Onomatopoeias were not included in these words. We then determined 36 adjectives in a check-all-that-apply manner, in which all adjectives that could be used to express hug scenes were selected by participants.

2.4 Tasks

The participants watched 24 videos, including hug scenes that were presented in random order. They evaluated each video on a grade of 9 for each of the 36 adjectives with 9 being “very” to 1 being “little,” and 5 being “neutral.”

They were then asked to categorize the adjectives into one of the three layers, psychophysical, affective/psychological, and evaluative/preferential. Each adjective had to be assigned to only one category in a forced-choice manner. Definitions of each category were presented to the participants. The psychophysical layer was explained by the physical properties of the hugging motion that could be judged. The affective/psychological layer was determined by one’s past experiences and feelings. The evaluative/preferential layer was an evaluation of the overall quality or preference of the hugs.

2.5 Data analysis

The layers to which the 36 adjectives belonged were determined through voting. When two layers had equal

votes for a certain adjective, the layer was determined through a discussion and consensus among the researchers. A similar method was adopted in [4].

The 9-grade evaluation results were normalized with z-scores within the individual, and principal component analysis was applied to the evaluation words in each layer. Principal components with one or more eigen values were adopted using the Kaiser-Guttman criterion. For clarity, the principal components were subjected to a promax rotation.

Multiple regression analysis was applied to the upper and middle layers, and the middle and lower layers, with the upper layer principal components as the objective variable and the lower layer principal components located one level below it as the explanatory variable, to see the association between the principal component layers.

3. Results

Table 1 shows the result of categorizing the 36 adjectives into three layers. A total of 4 adjectives were classified in the evaluative layer, 19 in the affective layer, and 13 in the psychophysical layer.

Figure 1 presents the result of the principal component analysis and multiple regression analysis. The values located beside the arrows are the partial regression coefficients from the lower principal component to one level above the principal component. R^2 is the coefficient of determination, which indicates how well one principal component is explained by the other principal components below.

Only the significant partial regression coefficients were

Table 1: Categorization of adjectives

| Layers | Adjectives |
|-----------------------------|---|
| Evaluative/ Preferential | reassuring, satisfying, joyful, attractive |
| Affective/ Psychological | relaxing, comforting, gentle, stressful, loving, arousing, full-hearted, sweet, sympathetic, exciting, enjoyable, possessive, sad, reliable, awkward, passionate, respectable, intimate, cheering |
| Psychophysical | physically warm, closely contacted, protecting, physically strong, dynamic, forcible, violent, tight, sudden, embracive, soft, feminine, passionate |

used. The evaluative layer was characterized by two principal components: *joyful* and *reassuring*. There are four affective layers: *reliable and intimate*, *enjoyable and arousing*, *possessive*, and *relaxing*. The psychophysical layer was divided into four principal components: *dynamic*, *embracive*, *forcible*, and *mannish*.

4. Discussion

Although the multiple regression analysis revealed the linkages among the principal components in each layer, it is necessary to consider whether they are semantically valid. In this section, we consider the principal components that are connected, particularly those with the largest partial regression coefficients.

Regarding the top layers, Figure 1 suggests the following. *Enjoyable and arousing* hug scenes are more *joyful*. Furthermore, *relaxing* scenes are *reassuring*. These relationships were semantically natural. With regard to the connections between the middle and bottom layers, Figure 1 suggests the following. The *embracive* scenes led to *reliable and intimate*, and *relaxing* experiences. Although, this aligns with the general impressions of hug scenes, the relationship between *enjoyable and arousing* and the lowest-layer principal components had a low coefficient of determination of 0.20 and was not fully explained by the lower-layer components. Additional psychophysical attributes may be required to explain *enjoyable and arousing*. While the meanings of *possessive* and *embracive* are semantically valid, the negative connection between *possessive* and *mannish* is

difficult to define, as *possessive* and *mannish* are used synonymously. Thus, the structure shown in Figure 1 is largely valid; though a user test for experimental validation of semantic structures such as the one used in [7] was not applied in the present study.

5. Conclusion

We investigated the structure of affective experiences while viewing hugging scenes, by determining the structure of the three layers: evaluative, affective, and psychophysical. These findings can be used to capture highly rated hugging scenes, and the methodology employed in this study is expected to be applicable to emotional scenes other than hugs.

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