Response to Reviewer 3 Comments

Many thanks to your advice on giving positive suggestions which are very helpful to improve research quality and value of the paper. Regarding to these questions raised in the review phase, I tried my best to amend and add needed contents into these points. Please find my revision as follows :

Point 1: The major contribution of this paper should be added in the last part of the introduction.

Response 1: The traditional visualization of popular science information is dominated by designers' subjective consciousness, ignoring the differentiated needs of the public for popular science information, so that different groups have different understanding and acceptance level, and the communication effect of popular science information is poor. It can optimize and identify the needs of people in different areas, and provide more accurate and effective scientific basis for popular science information design. It is beneficial to construct the theoretical system for public health emergency prevention and comprehensively improve the ability of the society to response and deal with public health emergency and risk resistance ability.

Point 2：Sections 1 and 2 need summarization. Also, section 2 does not need any introduction explanation, it should be shown the proposed approach.

Response 2: Add the following to the last paragraph of Section 1: Information visualization design has become one of the most active research fields in biomedicine. It is a kind of method and technology that will simplify abstract concepts, visualize professional knowledge, visualize huge data and display complex events in a panoramic manner. In public health events, many media use visualization tools to better interpret professional knowledge in the field of public health, which plays an important role in the of health propagation process.

Add the following to the last paragraph of Section 2: The text, data and other difficult contents in popular science knowledge are processed and designed according to visual logic, and the knowledge information is transformed into vivid and interesting graphics, and the relevant information is presented quickly and clearly, so as to achieve the high integration of emergency popular science and visual aesthetics. It is an important means to achieve effective communication, to enhance the public's scientific cognition of the event, so as to improve the public's awareness and behavior of preventing public health emergencies.

Point 3：The details of the Fuzzy such as membership function, rules, fuzzifier, and defuzzifier should be explained exactly.

Response 3: Fuzzy comprehensive evaluation method, based on fuzzy mathematics, is used to optimize factors. The comprehensive evaluation method transforms qualitative evaluation into quantitative evaluation according to the membership degree theory of fuzzy mathematics, that is, using fuzzy mathematics to make an overall evaluation of things or objects restricted by many factors. It can solve vague and hard-to-quantify problems, suitable for all kinds of non-deterministic problems.

Point 4：Since Figures 1, 2, 3, 11, and 12 are from other research, they should be cited in the caption. Also, the texts inside these figures are not clear to read, is there any solution for it?

Response 4: Figures 1, 2 and 3 have been modified. There is no text in Figure 11. Figure 12 has been compressed to the highest image quality due to upload limits on image pixels, besides the relevant text is explained in Table 3.

Point 5：Figures 12 and 13 are the same. One of them should be removed.

Response 5: Figures 12 is a design sketch, whereas Figures 13 is a real picture that was put out in the community for testing, so they are different.

Point 6：In page 7, the authors wrote "When acquiring information, designers should use statistics or machine learning methods". Could you explain why ML is required? What are your suggestions in terms of method, dataset?

Response 6: Machine Learning (ML) is a multidisciplinary discipline, involving probability theory, statistics, approximation theory, convex analysis, algorithm complexity theory and other disciplines. It specializes in the study of how computers simulate or realize human learning behavior to acquire new knowledge or skills and reorganize the existing knowledge structure to continuously improve its own performance. The paper refers to the use of machine learning method can better obtain popular science information.

Point 7：There are some methods in ML that are suitable for feature extraction. The authors need to explain why their approach is better than them. Also, a comparison with state-of-the-art research is required.

Response 7: This paper does not mean that machine learning (ML) is better than others, but just that there can be one more good choice.

Point 8：Page 11 is not readable due to overlapping figures and texts.

Response 8: Done.

Point 9：All assumptions and restrictions of this work can be explained.

Response 9: This study comprehensively and systematically analyzes the problems and deficiencies of the science popularization during public health emergencies. How to make good use of information visualization design is to grasp the focus of emergency science popularization. In the context of public health emergencies, the dissemination of emergency popular science information meets the public's cognitive needs for science. The quality of information visualization design directly affects the effect of popular science. The traditional popular science information design lacks the excavation of the public's perceptual needs, the content and form are similar, the accessibility is weak, the accuracy is insufficient, and the form is "floating", which is difficult to meet the public's differentiated demands. Public health emergencies have strong pertinence and high requirements for popular science. Explore how perceptual narrative theory can improve the accuracy of popular science information design, and solve problems such as cognitive barriers in interpreting popular science knowledge in different regions and groups, so as to reach out to the crucial reason that the traditional emergency popular science information design is too subjective

and not accurate, and achieve the purpose of the effectiveness of emergency popular science information design. So this is the focus of the study.

Point 10：The future work directions should be explained in the last part of the paper.

Response 10: Research directions will be explored in the future from the following aspects: (1) Improve the method of mining public needs. The method used in this study shall be combined with KANO model to more accurately explore the public's demand for popular science information. (2) Increase the number of popular science information elements and sufficient sample tests in the study to improve the accuracy of the design, which can further improve the matching between popular science information design and public psychological needs. (3) Broaden cooperation channels. Designers can work with public health experts, communication scholars and public opinion analysts to cross integrate statistics, iconography, computer vision, aesthetics, communication and other disciplines to study popular science information design methods and expand the scope of research application.

Point 11：Some related works in 2022 should be added with their pros and cons.

Response 11: which are mainly reflected in the following aspects from the perspective of design and communication: firstly, there is a lag in the education of emergency popular science knowledge and many information is released after the occurrence of public events, which means it is lacking timeliness; secondly, the content and the form of emergency popular science knowledge that ignore the perceptual demands of the public are single and old and is short of aesthetics and attraction; thirdly, the emergency popular science information is fragmented and not accurate for the target group, resulting in different understanding and acceptance degrees of different groups.

