User Experience and Usability study of the Stress+ application

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***Abstract*—Evaluating stress is a challenging task, given the complexity and the different approaches that can be used. In this paper we provide a software inspired by the MIST protocol, which aims to automate the process and make it smoother for the researcher. Here we focus on a user experience and usability study with the support of the AttrakDiff system that aims to evaluate how easy and appealing it is. The output will be used for future iterations of the design process.**

I. Introduction

Stress is one of the key actors in our society today. If it goes above a certain threshold, it could bring adverse effects to a person's health [1]. This explains why it is important to understand the physiological mechanisms that relate stress to illness.

To investigate stress in the laboratory, researchers have established paradigms, such as the Trier Social Stress Test, focused on public speaking and mental arithmetic and the Trier Mental Challenge Test (TMCT), with computerized mental arithmetic and negative feedback. To evaluate how stress activates the brain in an imaging environment, the Montreal Imaging Stress Test (MIST) protocol was developed, using the TMCT as a basis [2].

The MIST approach takes a step forward in terms of reproducibility, since it provides a software that keeps a record of the performance of the user in the arithmetic test and it is adapted to produce social stress in an interactive setting, where the test leader induces pressure in the form of negative feedback. This methodology has shortcomings because of the need of a constant participation from the test leader during the whole procedure, which makes it highly time demanding and therefore difficult to implement.

To overcome these disadvantages and improve the flexibility and user-friendliness of the MIST protocol, Stress+ is proposed as an alternative. It is a web application inspired by the MIST software which aims to provide new ways to generate social stress without the need of a continuous involvement from the test leader and also simplifies the research process. To achieve this, the application has different components besides the well-known arithmetic test, and also offers an organized and comprehensive user interface to simplify the process of test creation.

In this paper, a usability and user experience study of Stress+ focused on the test creator is presented. The objective is to evaluate the current prototype and establish a baseline upon which the product can be improved by identifying the points the users found less intuitive, attractive or useful.

II. Methods

A. Participants

The study included five participants with the unique criteria of having some degree of familiarity doing research following the MIST protocol.

B. Materials

The basic requirements to participate in the study were: access to internet connection and a modern web browser (Firefox, Chrome). The software Zoom [3] was used for the online session and remote screen-sharing technology.

The AttrakDiff ™ questionnaire [4] was implemented to obtain a quantitative measurement of the user experience and usability. To provide the questionnaire to the participants and organize the results, the infrastructure offered after registering in the AttrakDiff web page was used [5]. The theoretical basis of the study is detailed in the subsection II-E.

The web application Stress+, available at https://stress-plus.herokuapp.com/ was the target of the study. This link was provided at the beginning of the meeting to all the participants. It is described in more detail in the subsection II-D

C. Procedure

1) Participants received an email with guidelines about the test, including the tasks to perform.
2) Participants took part in the usability test via remote screen-sharing technology using Zoom.
3) The study facilitator gave an overview of the test to the participant.
4) The study participant followed two tasks sequentially (the details are included in the appendix in VI-A:
   - Create a stress test pipeline with specific parameters
   - Save the test pipeline of the first task, retrieve it after closing the application and send the link to the facilitator
5) After the tasks, the participant completed an online usability questionnaire.

Fig. 1. Management page of Stress+

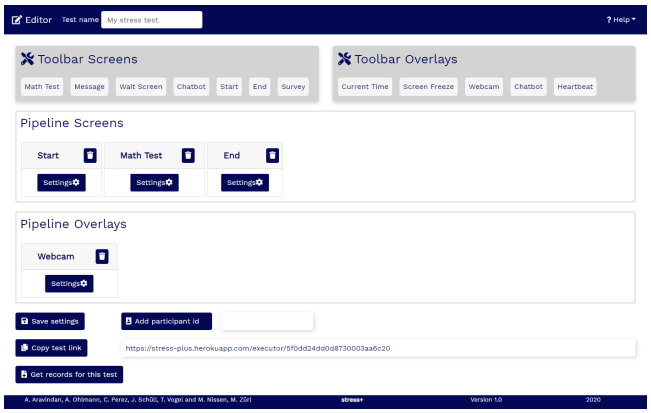

Fig. 2. Editor page of Stress+

6) There was an open space for discussions and suggestions.

D. Stress+ pages to evaluate

The usability study focused on two of the pages of the application: the management page and the editor. Both of them are used only by the researcher.

The management page appears after selecting the button "Go to management page" in the home page. It shows all previously saved stress tests. It is possible to open a test by clicking on it. Clicking on the thrash button deletes that particular item. Following the "New" button To create a new stress test, opens the Editor with an empty test. A screenshot is shown in figure 1

The editor page is the place where the test is created. The name of the test can be assigned using the text field on top. The available screens and overlays are organized in the respective toolbars. The user creates a pipeline using drag and drop. After that, each of the item's settings can be modified. The stress test can be saved with the button "Save settings" at the bottom. A screenshot can be found in figure 2.

E. AttrakDiff

AttrakDiff is built upon Hassenzahl's model for user experience [6], illustrated in figure 3. He assumes that a product

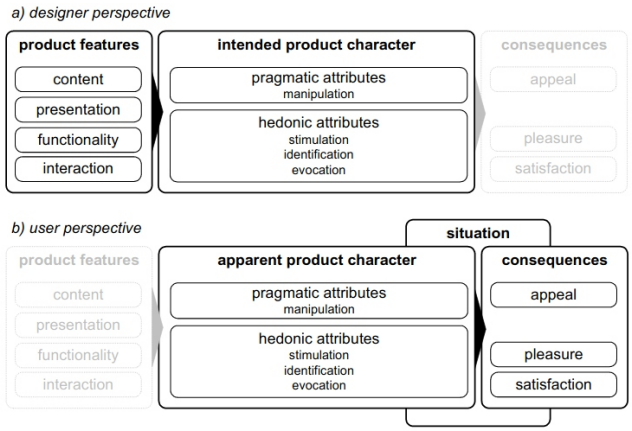

Fig. 3. Hassenzahl UX model [6]

has features that are manipulated by the designer to convey an intended product character.

Each person who uses the product constructs a personal version of the product character, consisting of pragmatic and hedonic qualities. This appears as consequences, such as judgment about the product's appeal, emotional(pleasure) and behavioral(satisfaction) consequences.

The AttrakDiff study evaluates the product character in its two groups of attributes: pragmatic and hedonic. A product is perceived as pragmatic when it provides effective and efficient ways to manipulate the environment. This is strongly related to the utility and usability. A product is perceived as hedonic if it provides stimulation, identification or provokes memories [7].

An illustrative example is the task of driving a nail. A pragmatic perspective would be using a hammer, which does the job without much effort. From a hedonic point of view someone might buy a certain brand to show professionalism, or other would buy a complete set of tools to build a hammer because it is more satisfactory than just using one [6].

To assess the perceived product character, AttrakDiff measures the attractiveness of the prototype in the format of semantic differentials, consisting of 28 seven-step items, paired as opposite adjectives and ordered in a scale of intensity from -3 to 3 [4]. It has been shown that hedonic and pragmatic qualities are consistent and independent, and both contribute to the attractiveness rating [7].

The ultimate goal for a product character is to have an uncompromising combination of strong pragmatic and hedonic attributes. But most likely, both are not in balance, which leads either to a primarily pragmatic product (task-oriented) or primarily hedonic product (self-oriented) [6]. This fact is explored in figure 4.

III. Results

A. AttrakDiff

We obtained the following results, shown in the grid view that maps hedonic quality and pragmatic quality in figure 4. This indicates that the product is slightly task oriented,

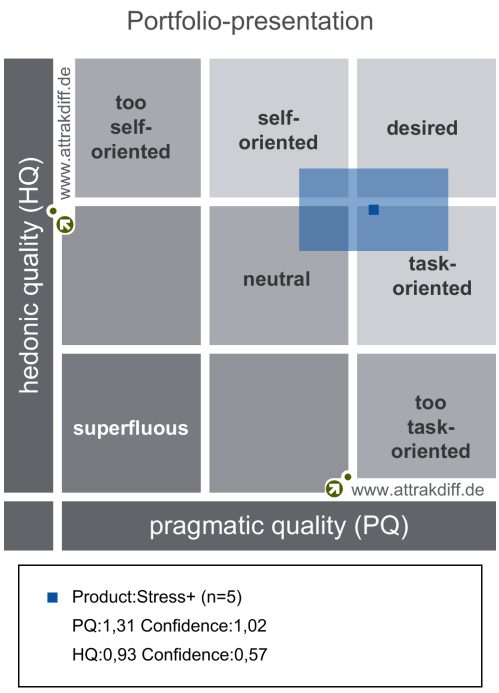

Fig. 4. Grid view

but given the confidence region, it is close to the desired combination of hedonic and pragmatic quality.

Figure 5 shows the average the scale of intensity of each of the 28 word pairs. According to it, the most important words for the pragmatic quality are **simple** and **practical**, **presentable** for the identity hedonic quality, **innovative** and **novel** for the stimulation hedonic quality and **good** for the attractiveness.

The diagram of average values shown in figure 6 shows the averages for each quality. All the scores are above zero, which means in all cases they evoke positive emotions. It also shows that Stress+ performs better in the pragmatic quality than in the hedonic quality.

B. Performance of the participants

All the participants were able to follow the instructions and finish the task successfully with a short explanation about the application.

Based on the observations of the performance of the participants during the tasks assigned in the study session, these are some of the most important points to improve:

- The difference between a generic `Message` screen and the `End` screen or `Start` screen was not intuitive at the beginning for some of the participants.
- The `chatbot` settings interface is not intuitive. It was not clear to the participants that the test expects a reply from the user in between each custom message.
- It could be useful to add auto save functionality: one of the participants accidentally closed the screen without saving for some time and most of the settings were deleted.

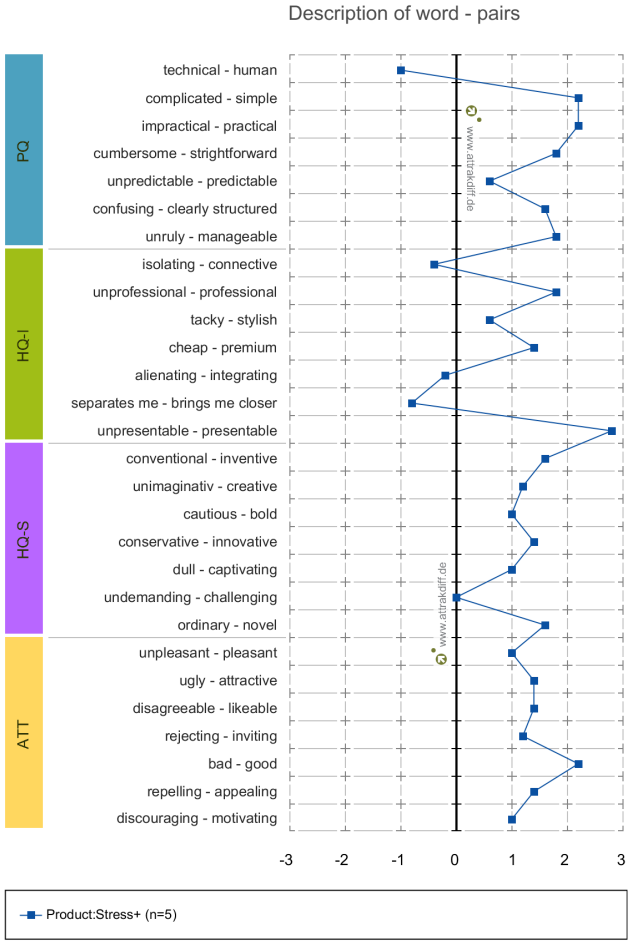

Fig. 5. Description of word pairs

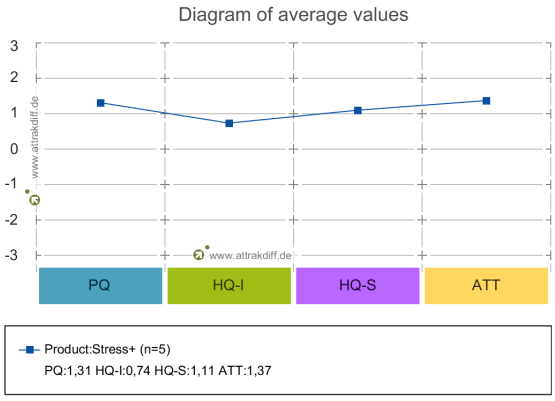

Fig. 6. Diagram of average values

The feedback received for improvement is summarized in the following points:

- Order the saved tests in the management page by creation date, with the newest at the top.
- The dark blue color for the buttons make them more

prominent than they should be.

- Reduce the size of the settings button.
- Chatbot functionality is still not realistic enough to be effectively used in a real stress test.

IV. Discussion

The current prototype has a good performance in terms of the user experience and usability, based on the quantitative results obtained from the AttrakDiff test and the comments received during the sessions.

Based on figure 4, it is possible to conclude that the product is near the desired value combination for hedonic and pragmatic qualities . This means the product is useful and at the same time likeable. The slightly higher choice of a stronger pragmatic qualities by the participants can be explained by the nature of the interface, being more technical in principle, mainly focused on the creation and modification of a stress test.

The results in figure 4 lead to the conclusion that the feeling of interactivity with the application (hedonic interactive quality) was the lowest of the evaluated qualities, in part influenced by its technical nature, even if the drag and drop feature should have improved this aspect.To be more specific, the majority of low scores in the word pairs belong to the hedonic interactive quality, as observed in figure 5. Words such as **isolating**, **alienating** and **separates me** were preferred over **connecting**, **integrating** and **brings me closer** respectively. One way to improve the interaction would be to provide a wizard that guides the user through the test creation and some settings modifications. Nevertheless, given that the Editor page is purely technical-oriented, it is not necessarily negative that it evokes these feelings in the participants.

The use of AttrakDiff facilitates the comparison with future iterations of the application, which is even a built-in option of the methodology. Another reason to choose it over other tools such as SUS (System Usability Scale) is explained by its holistic view which not only includes usability evaluation in the form of pragmatic qualities, but also emotional aspect as hedonic qualities in a single questionnaire. The test is also intuitive and provides little burden for the participants. It is also easy to put in practice in a remote study such as this case. Besides, its results have a clear and fast interpretation.

The feedback given by the participants was mainly in the direction that Stress+ is a considerable improvement in comparison to the MIST software they have used before. It was also easy for them to get started using the `Editor` page and therefore they could focus on more specific details of the user interface during the study.

V. Summary and outlook

Stress+ is a web application that builds upon the MIST as a tool to help researchers study in the laboratory how stress is related to illness. It achieves that by providing more features and enhancing the user experience of the researchers with the application. After performing a user experience study with the help of the AttrakDiff system, we discovered that Stress+ is already addressing some of the pain points of the previous protocols have, and also know in which direction to apply changes to improve how the users interact with it.

The next step is to apply changes to address the comments from the participants and the shortcomings observed after they performed their tasks and then use the same analysis tools to evaluate the user experience and usability of the new iteration of the prototype. By using the results obtained in this first study as a baseline, it would be possible to judge whether the changes are in the right direction and where they impact the most.

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VI. Appendix

A. *Tasks performed by the participants*

Task 1

1) Create a new test with a custom name
2) Add the following screens:
    a) Wait screen
    b) Start screen
    c) Math test with control activated, difficulty 1
    d) Message to indicate a new test
    e) Math test, sound activated, 40 seconds, difficulty 4
    f) Chat bot. Create a 2-step dialogue asking about performance
    g) Math test. Choose your parameters
    h) End message
3) Save the test

Task 2

1) Save the test
2) Close the page
3) Use link to open again
4) Enter to your saved test
5) Get the link and copy it in the zoom chat.