



DESIGN FOR RELAXATION: A MODEL FOR UNDERSTANDING STRESS FOR DESIGNERS

Stoop, Michèle; Snelders, Dirk
Delft University of Technology, The Netherlands

Abstract

Stress is negatively affecting a large part of society. Knowledge on treating stress is available in the literature even though the phenomenon has yet to be fully explained. Designers could transform these insights into useful products and services that could support people affected by stress. Based on a study of the literature, a model is created called Design for Relaxation. The model is validated using an analysis of the work of design students addressing work related stress. The conclusion is that the model can be used by designers to develop future products and services to counter excessive levels of (work related) stress.

Keywords: Design methods, Product-Service Systems (PSS), User centred design, Stress, Design strategy

Contact:

Michèle Catharina Johanna Stoop
Delft University of Technology
Industrial Design Engineering
The Netherlands
michele.stoop@gmail.com

Please cite this paper as:
Surnames, Initials: *Title of paper*. In: Proceedings of the 21st International Conference on Engineering Design (ICED17),
Vol. 4: Design Methods and Tools, Vancouver, Canada, 21.-25.08.2017.

1 INTRODUCTION

Stress has become a common worldwide ‘illness’ and continues to affect an increasing number of people. An important location and source of stress for people is the workplace. More than one-third of American workers experience chronic work-related stress according to a national survey (American Psychological Association, 2013). According to a study in The Netherlands, 14% of the Dutch employees have burn out symptoms as a consequence of stress (CBS, 2014). Researchers estimate that the overall costs of stress, anxiety and depression for employers in the UK amounts to £1035 (€1220) per employee per year (European Agency for Safety and Health at Work, 2014). Besides monetary concerns, excessive levels of stress affect people in their individual situation as well as society at large; it should be considered as a key problem of our time.

Stress research is mostly done by researchers in the field of medicine and psychology (Cooper and Dewe, 2004). At the same time, there is a burgeoning market for stress products and services, offered by agents whose (self-proclaimed) expertise on stress is often tentative. To a considerable extent, the lack of a solid research foundation for these products and services is due to the fact that the main body of stress research is aimed at policy measures for medical and therapeutic treatment. The knowledge from this research does not explicitly cater for questions that designers of new products and services might have. These are questions about how people can improve their lives based on changes in the material conditions of their lives, i.e. the products and services that surround them.

This disconnect between stress knowledge and design requirements is surprising, because the underlying causes of today’s excessive stress levels can be related to badly designed products and services: we are pushed into excessive multitasking by computers and other smart devices, our sleeping patterns get disturbed by blue light emissions from screens, we experience constant and inescapable social pressures from new media, etcetera. By implication this means that deficient design decisions are an important pillar under today’s stress epidemic.

The stress research that is done in the field of medicine and psychology has resulted in many insights, describing isolated parts of the stress process. One of these insights is that stress can have very different causes for different individuals, resulting in a fragmented and complicated view of stress reactions (Payne, 1988). This fragmentation limits design efforts in this field. Design, as an integrative, synthesising process, needs a broader outlook on stress, and a sensitivity to the interrelatedness of the diverse aspects described in stress research. Fortunately, there are models that describe stress reactions in more general ways, and that allow for a less compartmentalised understanding of stress. The goal of this paper is to review such models, and to synthesise them with the particular objective of formulating strategies for ‘design for relaxation’. The model thus helps designers to use insights into stress in a structural way, with a strong scientific foundation. The model will allow designers to plan for a good user experience, considering cognitive, emotional and social mechanisms in the build-up and release of stress. Combined with user research into particular contexts and journeys, the model can provide guidance for application in specific use cases. Finally, by using a model that describes and provides strategies for the whole stress cycle it becomes possible to create more complete solutions (and to embed part solutions into them). By doing so, design can begin to play a part next to policy measures towards stress, which should result in more complete and more effective solutions.

Below, we will start with an overview of the literature on which the model is based. Strategies that can be used to unwind and relax are identified in the literature, and integrated into a newly proposed model, called Design for Relaxation. Next, we will report on a validation study in which the strategies identified in the model are tested. Finally we will discuss the limitations of the model and validation study, and how these might be countered by future design research on stress.

2 DESIGN FOR RELAXATION MODEL

The Design for Relaxation model (Figure 1) shows a schematic overview of stress responses. The model is based on literature that is selected on relevance for design strategies and number of citations. In addition, only the original sources for relevant theory and/or findings were consulted. The model was

constructed along a number of key concepts that are commonly used in the literature for describing the notion of stressors, the appraisal of stressors, and stress related psychological states.

2.1 Stress and relaxation

Our description of the model starts with the relaxation state. This is a state in which a person is not experiencing stress, and is in an unaroused state. Multiple types of relaxation states or R-states are identified by Smith, which can be subdivided in four basic relaxation categories namely: sleepy, disengaged, physically relaxed and peaceful (2007).

Stress is triggered by a stressor (Selye, 1975), any nonspecific stimulus that causes the stress reaction (a nervous impulse, a chemical substance or lack thereof, or a psychological threat). It is rarely a single stressor that makes the person stressed. Mostly it is a build-up of stressors of which the last one triggers the stress reaction, activating the person who is in the relaxation state.

Primary appraisal occurs every time a new stressor is perceived. During primary appraisal a stressor is evaluated for being potentially threatening (Lazarus and Folkman, 1984). If this is the case the so-called fight-flight response is triggered. This is a response that prepares the body for action when a threat is detected (Cannon, 1932). Fight-flight responses cause an initial stressed state; the body is activated to respond quickly to its environment, resulting among others in increased central nervous system arousal, more blood to muscles, increased heart rate, increased breathing and endured emotional excitement (Cannon, 1932). How a stressor is appraised differs from person to person as it is depended on endogenous (age and gender) and exogenous conditions (self-esteem, social support and socioeconomic status) (McEwen, 2007). A person returns to the relaxation state if the stressor turns out to be non-threatening. If, on the other hand, the stressor is deemed a threat, the person enters into an initial stress state.

Secondary appraisal occurs during the initial stress state. During this state an evaluation is made whether the stressor(s) can be dealt given available resources (Folkman, 1997). When a person appraises the situation as possible to cope with (s)he enters a eustress state, which is a positive performance stress state (Sarada and Ramkumar, 2015; Selye, 1975). During eustress a person is able to act above average in terms of speed, power, accuracy, etc. In this state the body prepares for peak performance, like a runner's body has done a warming up and is ready to run. A person enters a distress state when they appraise the situation as impossible to cope with (Selye, 1975; Folkman, 1997). In a distress state a person feels panic and fear, which is a negative and undesirable response to a demand which is asked from the body by a stressor (Selye, 1975). The final stress state can thus be a positive eustress state or a negative distress state. However, even in cases of eustress the ultimate goal is relaxation, since prolonged episodes of eustress may be as exhausting (and thus distressing) as distress as they are both types of stress (Selye, 1975).

Primary and secondary appraisal occur unconsciously (Lazarus, 2001), and continue until the stressors are perceived as either non-threatening (leading to a relaxation state) or as possible to cope with (leading to eustress). These appraisals are reactions to stressors that happen automatically. Like reflexes, they occur without being observed by the person him- or herself. For this reason, it is important to make users aware of stressors and distress states. Awareness will enable users to perceive their stress state and thus trigger them to actively adapt their state.

Primary and secondary appraisal also depend on and happen within a larger social context, as the social context is directly related to the threatening and capability evaluation of a stressor. Other people such as family, friends and colleagues, as well as social institutions and media set norms, standards, and expectations that co-determine how threatening stressors are, or how easily they can be coped with. The social setting also determines people's capabilities to influence a stressor. This means that the social context has an impact on primary and secondary appraisal, and also on stressors themselves (Ekman, et al., 2011). As an example, think of an office worker who has to meet up to conflicting expectations from home and work, and who relies on colleagues and family for help in achieving eustress and relaxation states. Thus, people who are relaxed, in an initial stress state, or in eustress or distress states depend on others to take them there, or keep them out of there.

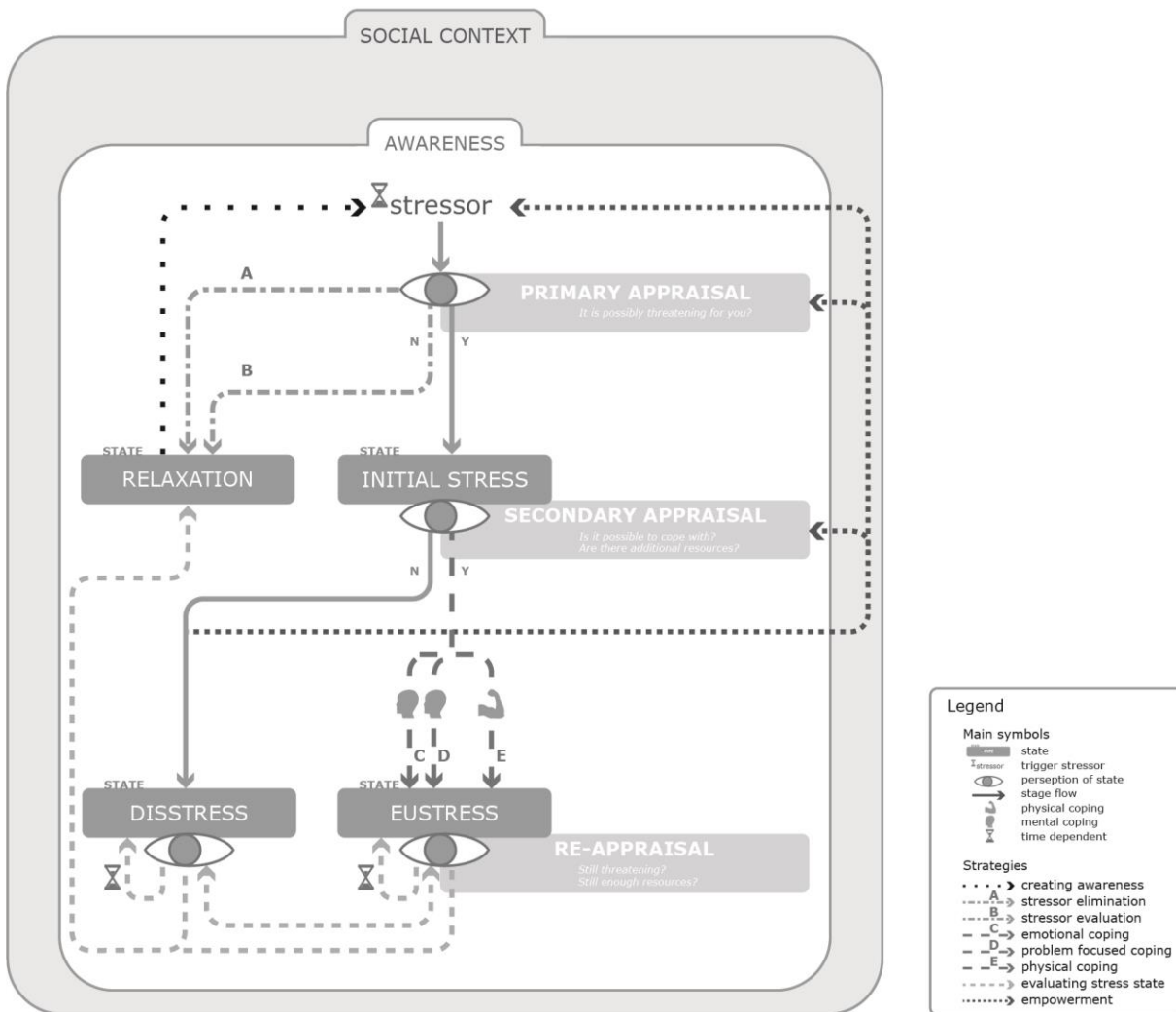


Figure 1. The Design for Relaxation Model

2.2 Strategies for relaxation

Several stages in the stress process are subject to influence and therefore can be used to design products that help a person deal with stress. Some stages are influenced by multiple factors and can therefore be addressed by combined and integrated design strategies. Figure 1 lists these strategies, and shows room for potential integration of strategies by its colour coding. Below each strategy, or group of strategies will be discussed in more detail.

2.2.1 Awareness

It is possible for people to become aware, or to make them aware of the stress process even though this process happens mostly unconsciously (Lazarus, 2001). Awareness of the type and number of stressors (yellow arrow in Figure 1) enables a person to understand which stressors are truly threatening and important to act upon. Creating awareness is listed here as a specific strategy. However, at the same time it is an overarching strategy because all other strategies listed below are enabled (or at least facilitated) by the awareness of stress and stressors.

2.2.2 Acting on stressors

When a person is aware of stressors and their effect it becomes possible to take action on them (orange arrows in Figure 1). Stressors can either be eliminated or re-evaluated as non-threatening to prevent an initial stress reaction and thus changed in affect and impact.

2.2.3 Coping techniques

When confronted with threatening stressors, someone can either go into a eustress or distress state. Techniques for coping with the threatening stressor may help the person to avoid a distress state and ending up in a eustress state instead (blue arrows in Figure 1). There are two basic types of coping: physical coping (Smith, 2007) and mental coping (Folkman, 1997). The first focuses on a person's bodily state, i.e. reducing the negative physical effects of stress with exercises, like breathing exercises. Mental coping focuses on the person's psychological state, i.e. on how someone understands and feels about the stressors. Mental coping can thus be problem focused (thinking through how to make the best of a threatening situation) or emotion focused (trying to accept threats with excitement rather than anxiety). All three coping techniques help people to live with stressors by influencing secondary appraisal of stressors: accepting them as potential threats, but with a higher level of trust in one's physical, instrumental and emotional resources.

2.2.4 Evaluation stress state

Another potentially useful strategy is evaluation of the stress state while experiencing stress (green arrows). This can be split up into deciding the type of stress state and whether the stress state is still needed (Selye, 1975). A person can continue to the eustress state (Sarada and Ramkumar, 2015), or to the relaxation state.

2.2.5 Empowerment

The final strategy is empowerment, which is an overarching strategy (red arrows). People can be empowered by creating an environment that educates or stimulates them to apply the above-mentioned strategies for relaxation (Ekman, et al., 2011). Empowerment implies products and services that enable the person to relax by reminding, and/or guiding the person to use coping or stressor changing strategies. There is also a social implication, because such products and services can connect people who are stressed, or show stress levels of a groups of people, thus make actions to prevent or curb stress levels more acceptable (Van de Garde-Perik, et al., 2014).

In conclusion, this model introduced five potential strategies that could influence the stress process. These strategies could be used by designers to design products that help a person deal with stress.

3 VALIDATION STUDY

The Design for Relaxation model lists five types of strategies that can be used to reduce stress and achieve a state of relaxation. However, these strategies have been derived from descriptive studies in medicine and psychology, outside the direct scope of design. For this reason, a small validation study was set up to test whether new designs for reducing stress can be correctly classified as belonging to one or more of the five types of strategies identified in the model. Six stress design projects carried out by students from Eindhoven University of Technology were used for this purpose. We tested to what extent our identification of the five strategies in the student projects matched with those of design students and staff members of a design school unrelated and unfamiliar with the projects (from Delft University of Technology). The design were selected based on a sufficient quality of their reports (containing full information about the addressed problem and proposed solution), and on whether they proposed only one concept (typically of a product-service system).

Twelve (mixed gender) students and staff of Industrial Design Engineering at Delft University of Technology acted as independent raters of the design projects. They were presented the Design for

Relaxation model and the five design strategies it contains. They were then given the design reports with the question to identify the design strategies that had been employed in the design projects. They got a visual representation of the model with a short explanatory text, a copy of the original design report, and an evaluation form. They were asked to browse through the report and identify the stress strategies used if any. The number of used strategies found by ourselves was not given to the raters. They then filled in the evaluation form in which they were asked which strategies from the model they identified, why they chose those strategies, and how they experienced working with the model. The total procedure took about one hour, with half the time spent by the presentation of the model, and the other half by the rating task.

Three 3 groups of four raters each rated 2 of the projects. So this means that each design project was classified two times in total: one time by ourselves to provide a comparison standard, and one times by the twelve independent raters who had no prior knowledge of the projects. The results from the raters where compared with our own predicted strategies to draw conclusions about the validity of the model.

3.1 Results session

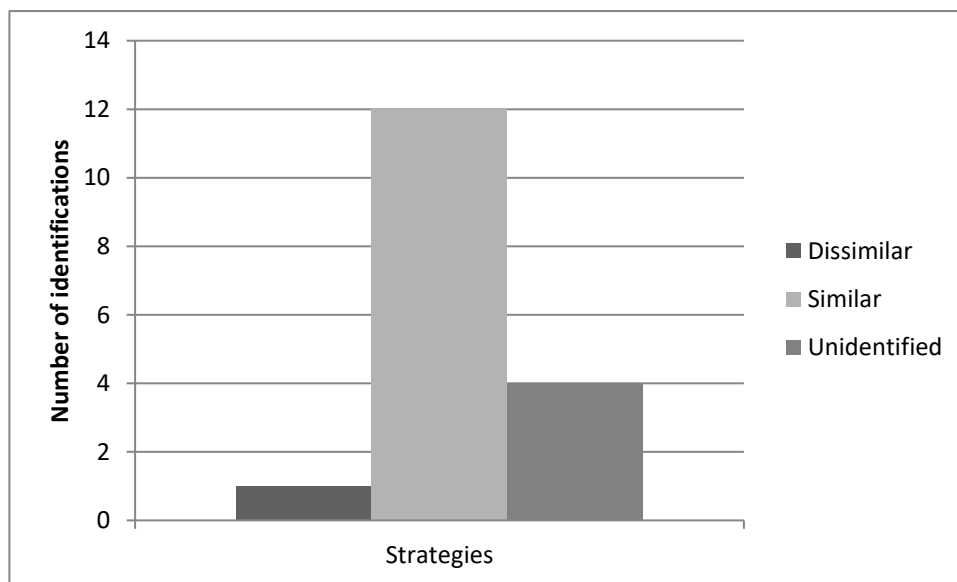


Figure 2. strategy identification

Out of the 17 identified strategies the researcher identified, 12 (71%) were also predicted by the independent raters. As a result, 4 of the 17 predicted strategies were not found by them, meaning that raters identified fewer strategies than we did ourselves. This is understandable given how much more time we have had to come to understand the model and read through the full reports. Only one identified strategy was explicitly different from the predicted strategies (in this case physical coping was chosen as strategy by raters, instead of the more overarching strategy of empowerment by the researcher). A closer look at this case shows that, again, the most likely source of discrepancy seems to be the limited evaluation time of raters compared to ourselves, which made them fail to evaluate all the information about the design provided by the prototypes and reports.

3.2 Conclusion

All strategies for reducing stress levels that are described in the literature can be found in student projects, and independent raters find overall the same strategies in these projects as we did ourselves. Thus, the proposed model is capable of describing relaxation strategies that are targeted in design projects, and that others can correctly recognize and identify in design projects. It can be concluded that the Design for Relaxation model can be used by designers to develop future stress related products.

4 DISCUSSION

This model is based on established literature that is created and used in several stress related fields varying from medicine to psychology. All research used in the literature study is found in research databases, such as Scopus, Web of Science, and JSTOR, and cited many times in other studies. The model is based on the literature either directly (by adopting part models into a bigger structure), or indirectly (by creating connections that are indicated in the literature). Most strategies, namely awareness, all coping strategies, dis/eustress state evaluation and empowerment could be literally adopted from literature. The changing stressor strategies are literally mentioned in literature, but not identified as strategy in literature. A possible explanation for this is the obvious nature of this last category of strategies.

Thus, the goal of this model is to create a knowledge overview for designers, so they can put it into practice. The first step of enabling this is to prove that the model is valid and useful for designers. This is done by looking at work of designers that have designed for relaxation and identify strategies in their work. The predicted strategies identified in these designers their works have thus served as a double check, namely to validate whether the whole variety of strategies can be found in designers' work and to create a comparison basis for the strategies that can be identified in design projects by others. In follow up research the model may be assessed on its usability: how can it enable designers to 'design for relaxation'?

As mentioned before in the results there was a single case in which another strategy was chosen than the predicted strategy. Physical coping was chosen as strategy instead of empowerment. The difference between these two is minimal, as the product that enables a user to use physical coping to relax was empowered by the product context. In this case the both identified strategies can be seen as plausible; even though the strategy implied by the designer is empowering, the product also simply reminds the user to apply physical coping. This may indicate a lack of knowledge to understand the difference between empowerment and other strategies. Especially the social aspect of empowerment is difficult to recognize for external observers (and possibly also for users). Improved results may be observed when users have used the model multiple times. This indicates that education or expertise is needed before this model can be used to its full potential.

Other limitations of this report research are the available resources. A qualitative research approach is chosen because of the limited number of participants and reports in combination with fact that no research was done using this model before. The result of this is that no statistical significance can be reported because of the limited number of participants. The participant target group is fitting as they are all people that have gotten design education, and are able to identify the designer's motives.

Not everything is known yet about the phenomenon of stress and thus future research may indicate new insights into stress that might change the number and types of strategies identified in this model. How to design for relaxation requires still more research, but this model has proven that it is possible to methodically design for relaxation. Our hope is that it will serve future generations of designers and others well in finding the solutions that will enable people to control stress. Finally, additions and improvements may come and should be integrated, but only small modifications are expected. The model's foundation is already strong, based on renowned research carried out over many decades, and therefore not expected to undergo significant changes in the near future.

REFERENCES

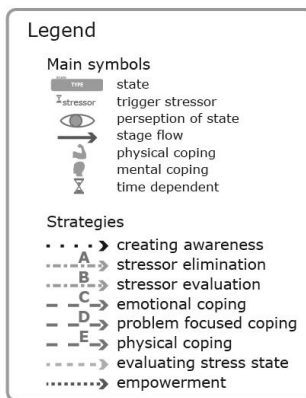
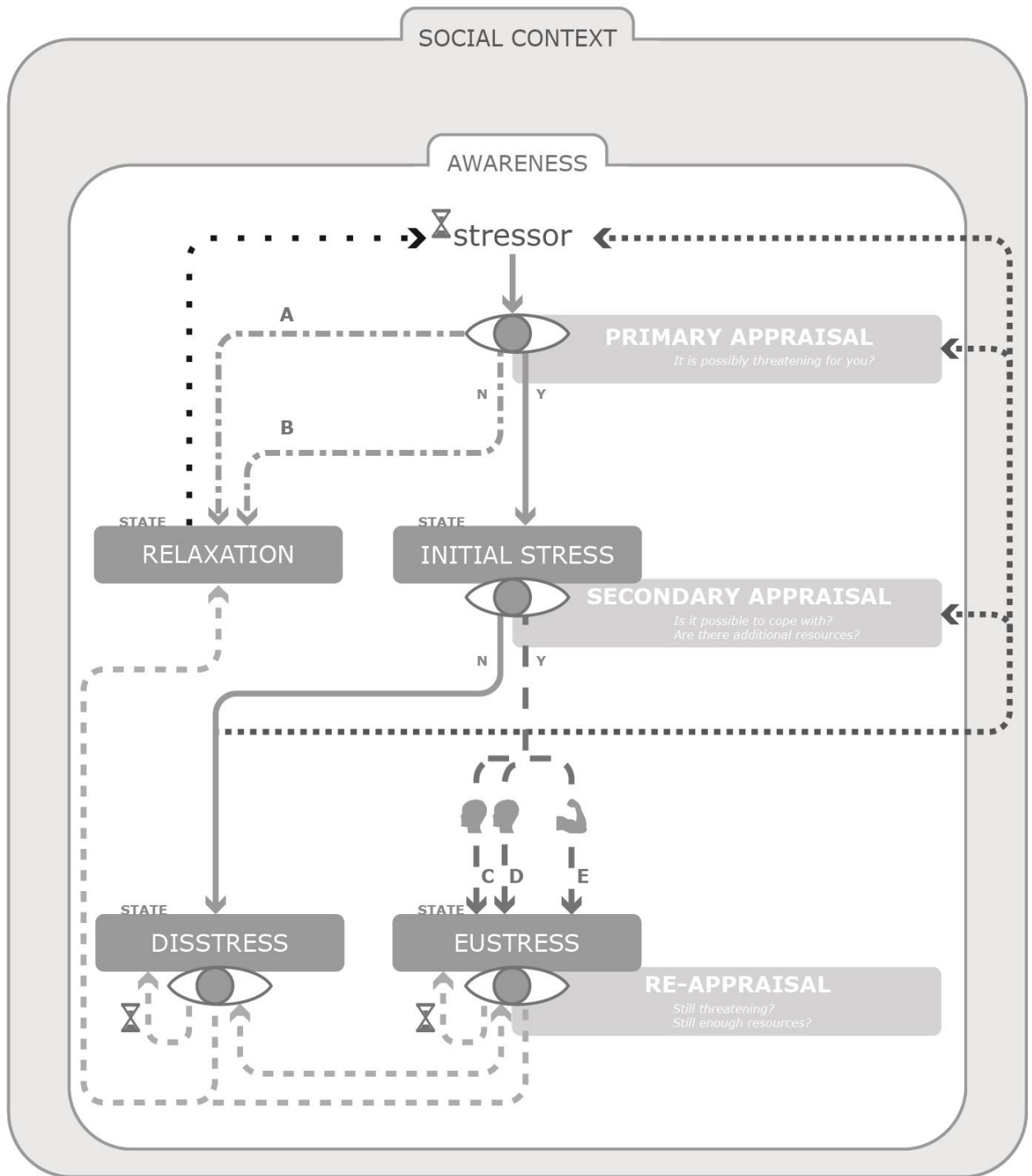
- American Psychological Association (2013), *APA Survey Finds US Employers Unresponsive to Employee Needs*. [Online], Available at: <http://www.apa.org/news/press/releases/2013/03/employee-needs.aspx> (3 March 2016).
- Cannon, W. B. (1932), *The Wisdom of the Body*, W.W. Norton & Company Inc, New York.
- CBS, (2014), *CBS en TNO: Een op de zeven werknemers heeft burn-outklachten*. [Online] Available at: <http://www.cbs.nl/nl-NL/menu/themas/arbeid-sociale-zekerheid/publicaties/artikelen/archief/2015/cbs-en-tno-een-op-de-zeven-werknemers-heeft-burn-outklachten.htm> (3 March 2016).
- Cooper, C. L. & Dewe, P. (2004), *Stress: A Brief History*, Blackwell Publishing Ltd., Oxford.

- Ekman, I. et al. (2011), "Person-centered care - ready for prime time", *European Journal of Cardiovascular Nursing*, pp. 249-252.
- European Agency for Safety and Health at Work (2014), *Calculating the cost of work-related stress and psychosocial risks*, Publications Office of the European Union, Luxembourg.
- Folkman, S. (1997), "Positive psychological states and coping with severe stress", *Elsevier*, pp. 1207-1221.
- Lazarus, R. S. (2001), "Relational meaning and discrete emotions", In: K. R. Schorr & T. Johnstone.(Ed.), *Processes in Emotion: Theory, Methods, Research*, Oxford University Press, Oxford, pp. 37-67.
- Lazarus, R. S. & Folkman, S. (1984), *Stress, appraisal and coping*, Springer Publishing Company, New York.
- McEwen, B. (2007), "Physiology and Neurobiology of Stress and Adaptation", *Physiol*, pp. 873-904.
- Payne, R. (1988), "Individual differences in the study of occupational stress", In: *Causes, Coping and Consequences of Stress at Work*, John Wiley and Sons, Chichester, pp. 209-320.
- Sarada, P. A. & Ramkumar, B. (2015), "Positive stress and its impact on performance", *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, Vol. 6, No. 2, pp. 1519-1522.
- Selye, H. (1975), "Confusion and controversy in the stress field", *Journal of Human Stress*, pp. 37-44.
- Smith, J. C. (2007), "The Psychology of Relaxation", In: *Principles and Practice of Stress Management*, The Guilford Press, New York, pp. 38-52.
- Van de Garde-Perik, E., Secomandi, F. & Snelders, D. (2014), "Design strategies for human relations in services", *Service Design and Service Innovation Conference*, 9-11 April 2014, Lancaster, Lancaster University, pp. 133-142.

ACKNOWLEDGMENTS

This study is supported by the Master Honours Program of the Delft University of Technology. Special thanks will go to all participants who were willing to participate in this research. I would also like to thank Dr. Evelien van de Garde and Prof. Dr. Ir. Pieter Desmet for their knowledge and advice as experts. Finally, I would like to thank Dr. Ir. Erik Tempelman as coordinator of the Master Honours Program from supporting this research.

APPENDIX 1 - FULL MODEL WITH SUB STRATEGIES



1

Creating awareness (Lazarus, 2001)

- └ Awareness about stress state
- └ Awareness about number and significance of stressors

2AB

Changing stressors (Selye, 1975) (Holmes & Rahe, 1967)

- └ Eliminate stressor
- └ Reflection stressor

note: Is stressor truly threatening? What are the criteria used? Are those criteria valid? The goal is to change the perspective on the stressors.

3C

Emotional coping techniques (Folkman, 1997)

- └ Positive reappraisal
- └ Spiritual beliefs
- └ Positive events
- └ Revised goals emotionally

note: Accepting emotionally that a goal is revised or should be revised.

3D

Problem-focused coping techniques (Folkman, 1997)

- └ Revised goals practically

note: Empowerment is needed in a lot of the cases to make it possible to revise practical goals, like the possibility to say 'no' to an extra assignment.

3E

Physical coping techniques focus (Smith, 2007)

- └ Stressed posture and position
- └ Stressed muscles
- └ Stressed breathing
- └ Stressed body focus
- └ Stressed attention

4

Evaluating stress state (Selye, 1975)

- └ Awareness eustress and distress
- └ Awareness possibility to change stress state
- └ Awareness whether stress state is still needed

5

Empowerment (Eman, et al., 2011)

- └ Enable to influence stressors
- └ Enable to evaluate threat of stressor
- └ Enable to use coping techniques