tags: #stress #eyetracker

links: Stress messen

What is stress?

in Cooper, Dewe, ODriscoll (2001)

- "wide discrepancies exist in the way that stress is defined and operationalized"
- the concept of stress has variously been defined as both an independent and a dependent variable (Cox, 1985) and as a “process"
    - → "defined as a stimulus, a response, or the result of an interaction between the two, with the interaction described in terms of some imbalance between the person and the environment (Cox, 1978)"

in Fink (2010)

- 'Stress is the non-specific response of the body to any demand' Selye (1956)

in Kim, Diamond (2002)

Stress is made up of three components:

- **Arousal**: ‘heightened excitability or arousal, which can be operationally measured using electroencephalography, behavioural (motor) activity or neurochemical (adrenaline, glucocorticoid) levels’
- **Aversion**: the experience must be perceived as uncomfortable or threatening
- **(Un)Controllability**: having control over an aversive experience has been shown to extremely mitigate how stressful a situation feels

Types of stress

- good stress = eustress
- bad stress = distress (strain)

Technikstress/Technostress/Technology-induced Stress/High-Tech Stress

> *„Technikstress ist eine spezielle Form von Stress, ein spezifisches oder unspezifisches Reaktionsmuster des Organismus auf äußere und innere Reizereignisse, die direkt oder indirekt durch Technik, das heißt schon durch die Gestaltung technischer Hilfsmittel, bei der Nutzung von technischen Hilfsmitteln und durch die allgemeine Einstellung und Akzeptanz gegenüber technischen Hilfsmitteln, entsteht und sein physisches und psychisches Gleichgewicht stört sowie seine Fähigkeiten zur Anpassung oder Bewältigung strapaziert oder überschreitet.“ (Hoppe, 2009)*
> show annotation

(eigene Übersetzung)[1]

- "any negative impact on attitudes, thought, behaviors, or body physiology that is caused either directly or indirectly by technology” (in Schellhammer, Haines, Klein (2013) aus Weil, Rosen (1997))
- a wide array of stressors that potentially result in increased strain on a worker: increased workload [10], constant pressure to adapt to new technologies [2], increased complexity of new devices [2], technology breakdown [18], etc. (Schellhammer, Haines, Klein (2013))
- "stress caused by an inability to cope with the demands of organizational computer usage" Tarafdar, Tu, Ragu-Nathan (2010)
    - information overload and interruptions
- Core Factors (aus Coklar (2011)):
    - Environmental Factors: Inappropriate working conditions or other environmental conditions, inappropriate lighting, insufficient equipment with security measures, equipment with compatibility issues, noisy equipment, incapable equipment, software limitations, lack of funding, electrical issues, risk of accidental data loss, insufficient maintenance knowledge, insufficient senior/adult personnel may cause people to suffer stress related with the use of technology
    - Societal Factors: Conflicts of interest caused by the use of technology, power struggles, work and role changes, anxiety over loss of employment,

work/employment fragmentation and hierarchal changes may cause people to suffer technology related stress. For example, an administrator who is decisive regarding the use of technology may press employees on their use of technology
    - → passt nicht zu meinen Aufgaben!
- Six core factors (aus Enis (2005):
    - rapid change, **lack of education**, **increased workload**, **lack of standardization** in work, **reliability of technology**, and role alterations
- Six core factors (aus Harper (2000)):
    - **information overload**, under-working and routine jobs, job insecurity and demotivation, and job uncertainty
- → die fetten passen zu meinen Aufgaben!
- situational awareness? → workload
- messen mit RED? (siehe Stress messen)
- Zusammenhang Stress und Technikstress?

Response-Based Model of Stress Cooper, Dewe, ODriscoll (2001)

- stress as a DV (a response to disturbing or threatening stimuli)

Stimulus-Based Definitions of Stress

- Identification of potential sources of stress
-

Sandoval-Reyes et al. - 2019 - Relationship Amongst Technology Use, Work Overload.pdf

“These new demands require that people increase their efforts to achieve the demanding performance objectives that correspond to the business models of a globalized world [3]. Therefore, people should increase their emotional effort, as well as levels of mental and psychological activation, which can lead to the depletion of resources and affect the process of recovery from work demands [4,5]. It is required that the physical and psychological state of the person remain optimal, ensuring adequate levels of energy, motivation and commitment [6,7].” (Sandoval-Reyes et al., 2019, p. 2)

“Connection to work thanks to developments in information and communication technologies implicitly implies an extension of the work day [8]. This can lead workers to

an unwanted state that can be called “always in work mode” [9] and that assumes ever-increasing workloads” (Sandoval-Reyes et al., 2019, p. 2)

“Some studies find that work overload is a characteristic of job satisfaction, despite leading to unhealthy patterns [8] mediated in turn by a desire for incentives, security status and the ability to be promoted [10,11]. Nonetheless, extensive literature shows that work overload is negatively related to health indicators [12,13]. Hence, work overload manifests itself as a stressor that may have an impact on the levels of recovery from long working hours and, as a result, low psychological detachment. Our study explores the possible relations” (Sandoval-Reyes et al., 2019, p. 2) What does work overload means? how does it manifest?

“A person’s possibility to be connected to their work environment all the time is positive, since they can have information in real time, be aware of possible contingencies and respond more agilely to problems that may arise [16]. Despite its benefits, the intensive use of information and communication technologies as management tools, dilutes the boundaries between physical spaces and work responsibilities. Furthermore, this can lead to extended working hours, making it more difficult for people to psychologically detach themselves from their work during break times. Likewise, the use of technologies prolongs exposure to work demands beyond the workday, wastin” (Sandoval-Reyes et al., 2019, p. 2) How does Technology implact stress? By removing work-life balance. People are more stressed out and cant disconnect. But does it relates to the stress during technology use?

“askvan and Kubicek [1] indicate that work overload is characterized by the need to work faster, the need for quicker responses, reduced break periods and the need to perform multiple tasks simultaneously. In general, work overload and the extension of working hours is a reality in many occup” (Sandoval-Reyes et al., 2019, p. 2)

(Sandoval-Reyes et al., 2019, p. 2) Another definition of work overload

“y have increased as a result of the acceleration of economic, social and technological changes worldwide. Franke [20] proposes that the phenomena associated with acceleration can be considered work overload. Therefore, it is presumed that the tools that facilitate this acceleration process to obtain agile solutions, such as the use of technologies, would also have implications for psychological distancing as part of the recovery from work-related stress” (Sandoval-Reyes et al., 2019, p. 2) Work overload also comes from accelerating technology, therefore Technostress and workoverload are linke in this way

“The only model to integrate this construct so far has been the stressor-detachment model by Sonnentag and Fritz [21], which considers detachment to be the central

mechanism influencing the health and welfare of workers, depending on how it is managed." (Sandoval-Reyes et al., 2019, p. 3)

"The present study addresses the relationship between the use of technology and psychological detachment from work as a result of work overload. Consistent with the mediation model undergoing empirical testing, the results indicate a positive relationship between the use of technology and perceived overload. Additionally, there is a negative relationship between work overload and levels of psychological detachment" (Sandoval-Reyes et al., 2019, p. 3) There's a 3 ways relationship between excessive technological use and work overload, and WO and psyhcological detachment. Its seems the later helps decrease the WO and to increase the ability to use technology

Brivio et al. - 2018 - Preventing Technostress Through Positive Technolog.pdf

"Today, technostress is considered to be multidimensional, and it is defined as "a negative psychological state associated with the use or the "threat" to use new technologies," which leads to "anxiety, mental fatigue, skepticism, and sense of ineffectiveness" (Salanova et al., 2007). The fundamental dimensions to technostress include" (Brivio et al., 2018, p. 1)

"- Techno-anxiety: the use of computers or ICTs that generates fear, apprehension, and agitation in the user; it includes feelings of uncertainty resulting when a person is required to carry out an action using a ICT (e.g., pressing a button), and the related fear of losing information (Salanova et al., 2013)." (Brivio et al., 2018, p. 1)

"- Techno-strain: perceived stress experience resulting from the use of new information technologies (Salanova et al., 2013). Research shows that many factors co" (Brivio et al., 2018, p. 2)

"Techno-invasion, for example, is defined as constant connectivity, without boundaries of space and time, which maintains that employees are continuously available to work requests (Tarafdar et al., 2007; Ragu-Nathan et al., 2008; Gaudioso et al., 2017)." (Brivio et al., 2018, p. 2) Relation to workload or mental load

Harris and Li - 2020 - Engineering Psychology and Cognitive Ergonomics. M.pdf

**"The very first impression drawn from the extensive review of the literature was the considerable difficulty in finding a consensus in the definition of "mental workload". Cain [7] reports that there is no commonly accepted formal definition of this concept. This author points out that it can be characterized as a mental construction that reflects the

“mental tension” resulting from the execution of a task under specific environmental and operational conditions, associated with the operator’s ability to respond to these demands.”

“It is a concept very close to that of fatigue, stress, anxiety and performance.”

“Moreover, mental workload has always been associated with professional positions in critical working fields, such as the nuclear, transport and aviation sectors, and has become an important issue as modern technology imposes increasing cognitive demands [64] and is now occupying a greater place in the fields of human computer interaction and computer science [33, 34].”

“In the context of learning, this theoretical model is aimed at supporting instructors in the development of novel instructional designs aligned with the limitations of the human cognitive architecture [43] and points out to three types of cognitive load: the intrinsic load or the level of difficulty in completing the task, the extraneous load or how the task is presented in the learning environment, and the germane load or the integration of information to long-term memory from the formulation of mental schemes”

**“To this day, technostress has become a serious problem for IT users and other professionals due to its potential negative effect on users’ mental capacity [59]. This concept has raised interest among the scholars, as it also falls under the notion that everything, including technology, has a dark side [48].”

“As many scholars have quoted, the concept of technostress was introduced by Brod [5], who described it as a “modern disease” caused by the inability of the individual to adapt to a type of technology in a healthy manner, and that can manifest itself in the event of the difficulty in accepting computer technologies and in the event of excessive identification with these technologies. According to Nimrod [39] the former definition was complemented by Rosen and Weil [46], who established that technostress can also have a negative impact on individuals’ beliefs, attitudes, and psychological and physiological characteristics. Considering previous definitions the concept of technostress can be considered as the amount of stress (constant or high) that a person feels and manifests when he or she uses a specific type of technology, or when he or she is in direct or indirect contact with it.”

“Techno-overload: Increased workload, higher working speed or change in working habits caused by new technologies”

“Techno-complexity: Inability to learn or manage the complexity of new technologies”

Alsuraykh et al. - 2019 - How Stress and Mental Workload are Connected.pdf

“In our research, we have seen both people that enjoy high workload, and people that feel stressed by it, but we do not know whether that experience of stress significantly affects our measurements. Our recent results show that fNIRS measurements are affected by stress (measured by SSSQ).” (Alsuraykh et al., 2019, p. 1) The SSSQ can segregate stress during high mental workload, but used fNIRS

“Some have pointed out that an increase in Heart Rate is linked with high mental workload [9] [52] while others show that increase in Heart Rate is also triggered by stress [10] [15] [46], and surprise [40], or indeed just physical movement.” (Alsuraykh et al., 2019, p. 1)

“has focused on fNIRS as movement-tolerant brain sensor for use in HCI experiments [27] [33] [37] [44]. For example, it has been used to evaluate the UX of software [34] and used to adapt tasks [1] [56]. While using fNIRS to measure Mental Workload during Air Traffic Control (ATC)” (Alsuraykh et al., 2019, p. 1)

“affecting the MWL and physiological measurements or not. We used, for example, the Montreal Imaging Stress Task (MIST) to manipulate stress (in the form of time pressure and negative feedback) whilst maintaining task demand (mathematical difficulty).” (Alsuraykh et al., 2019, p. 1) Why was it mathematically demanding?

“The relationship between MWL and stress is much more complicated than: high workload is bad, and indeed that: experienced stress is bad. As there is a lack of clarity in how stress and MWL are related, because they are used to describe often similar phenomena, this paper reviews literature to clarify the relationship between these two concepts, and elaborate on why they are hard to study separately.” (Alsuraykh et al., 2019, p. 1)

“MWL has been described as “the relationship between primary task performance and the resources demanded by the primary task” [52]. In other words, MWL is the relationship between demands placed upon individuals and their capacity to cope with it.” (Alsuraykh et al., 2019, p. 2) You're getting a high task like coding. How well do you cope with it. Are you "overwehlmed" or do you feel confident etc... handling that.

“Many measures for assessing mental workload have been developed and they are classified into three types: performance-based assessment, subjective workload assessment, and physiological workload assessment [53].” (Alsuraykh et al., 2019, p. 2) What are the 3 criteria that aremeasured to asses MWL and how do they connect to overall stress?

“In the case of overload, users may even stop reporting ISA scores, because they lack the spare capacity to complete this secondary task.” (Alsuraykh et al., 2019, p. 2)

“In order to gain better understanding of the measurement process of MWL, the following MWL framework by [52] might be useful. It comprises three main parts: 1) the physical and cognitive task demands, 2) the operator’s workload and 3) the performance (See Figure 1).” (Alsuraykh et al., 2019, p. 2)

“hysical and cognitive task demands are a reflection of a task’s features that are imposed on a person. It is necessary to determine the work demands that individuals might face in order to measure Mental Workload. In addition, because the demand could be perceived differently by different individuals, it is essential to measure both the imposed demands and perceived demand.” (Alsuraykh et al., 2019, p. 2)

“Operator workload can be defined as “equivalent to measures of operator strain or effort” [40]. Several MWL measurements focus only on measuring the operator experience during and after the task using different subjective questionnaires, however, it has used the measures of effort from behaviour indices and the impact of effort physiology” (Alsuraykh et al., 2019, p. 2) Do operator workload actually correlates with stress?

“According to [28], they indicated that the meaning of the term “stress” has no precise consensus. It has been defined the “Stress” as the lack of balancing between environmental demands and individual capabilities [30]” (Alsuraykh et al., 2019, p. 2) defintion of stress again

“n other words, stress could indicate to the coping with the external or internal adverse conditions (stressors), which is the behavioural, psychological and physiological responses [12].” (Alsuraykh et al., 2019, p. 2)

“However, some researchers have defined the term of stress as non-equivalent degree between demands made upon a person and his/her ability of coping with those certain demands.” (Alsuraykh et al., 2019, p. 2)

“Commission Directorate-General for Employment and Social Affairs (2003) described it as a “state characterized by high levels of arousal and distress and often feelings of not copin” (Alsuraykh et al., 2019, p. 3)

“From this point of view, it has been revealed that the psychological stress is the consequence of individuals’ appraisals of their environment as exacting or exceeding their resources and/or hazard their safety [30” (Alsuraykh et al., 2019, p. 3) better definition of stress

“0]. The estimates of demanding or threatening surrounding environments are multifaceted, reflecting emotional (affect), motivational (conation), and cognitive processes. However, across nearly all of these dimensions, the notion of ‘too much workload’ recurs” (Alsuraykh et al., 2019, p. 3)

“In addition, it has been suggested that one definition of stress is that ‘the demands of an event exceed personal resources and is motivated by the emotional response to harm and threat’ and, in short, is ‘the relationship between the person and the environment’ [30]” (Alsuraykh et al., 2019, p. 3)

“In addition, it has been suggested that Psychological stress influences numerous psychological and physical processes in healthy individuals and those with psychiatric disorders, and it is thought to influence mood, memory, and decision-making. Interestingly, such stress can be captured, in a way, by using NASA-TLX (for Mental Workload), which has Frustration as a subscale.” (Alsuraykh et al., 2019, p. 3) MEasurement of stress by NASA TLY (Frustration)

“HR [7” (Alsuraykh et al., 2019, p. 3)

“1) primary appraisal which includes the location of a event, such as stressful, and 2) a secondary appraisal appears after an evaluation of the event, such as threat or challenge.” (Alsuraykh et al., 2019, p. 3)

“There is similarity between the Transactional Theory of Stress by [14] and the Framework for MWL by [51]. In MWL framework, the operator workload is influenced by the way that task is perceived by the operator, while there is association between demand and performance. It has been pointed out that the outcome demand created by a combination of physical and cognitive task demands and external and internal influences [42]” (Alsuraykh et al., 2019, p. 3) Looks like stress depends on how the operator defines it. NOt necessarily if its WM is overwehlmed. It's like an embebbed cognitive apraisal related to the incapacity of handling the demands or maintaining performance

“Therefore, if an individual has high capacity to respond to an increased demand, he/she will be less likely to experience a stress response and indeed any stress response could be both” (Alsuraykh et al., 2019, p. 3)

“psychological and physiological. When we consider these models together then, it appears to be the case that stress and MWL are strongly interconnected.” (Alsuraykh et al., 2019, p. 4)

“3.1 Measuring MWL and Stress There are various subjective methods that are commonly used to assess the impact of psychological stress and mental workload on performance, such as the NASA Task Load Index (NASA TLX) [21] and the Short Stress State

Questionnaire (SSSQ) [22]. It has been indicated that such stressors could increase the mental (cognitive) workload significantly [20]. Firstly, a number of studies that highly connected the aroused stress with reducing the capabilities of decision-making and lower performance [23] which could have a negative effect on person's ability. It has been argued that task performance could be reduced by stress which influences individual's concentration and time [39]." (Alsuraykh et al., 2019, p. 4)

"n addition, a great number of studies of the psychophysiological measurements have been conducted to conclude the level of workload and stress from measurements of the Autonomic Nervous System (ANS) activity. For example, it has been revealed that the levels of task difficulty during a simulated flight scenario affected both the heart rate (HR) and blood pressure [50]. Moreover, several researchers found that the MWL which assessed by the NASA TLX was significantly related to the HR [53]." (Alsuraykh et al., 2019, p. 4) heart rate and MWL and stress. NASA LTX looks interesting

"Various studies have attempted to measure the stress and MWL, which can be divided into three categories: (1) Self-reporting and subjective ratings using standard questionnaires such as the NASATLX [21] and the SSSQ [22]) ; (2) Behavioral measures, such as primary and secondary-task performance; and (3) physiological measurements, such as including Heart Rate, Skin Temperature to monitor task demand (MW) [8] [20] [50] as well as stress level [9] [14], pupillometry, electromyography, galvanic skin response, and brain activity [51] [53]." (Alsuraykh et al., 2019, p. 4)

"Several experiments have been examined the stress and MWL. For example, it has been found that there are significant correlation stress and mental workload (positive correlation) which means when the subjects have higher mental workload and more negative emotion, they tend to experience more stress [55]" (Alsuraykh et al., 2019, p. 4)

"it has been revealed that there is tight link between mental workload and psychological stress during flight task, where there found a significant positive correlation between HR and mental workload/psychological stress [11" (Alsuraykh et al., 2019, p. 4)

"ough a large number of experiments have showed that MIST was worked efficiently and effectively in terms of inducing stress level, our studies revealed that MIST increased experienced mental workload as well as stres" (Alsuraykh et al., 2019, p. 4)

"Indeed, its mechanism relies heavily on increasing time pressure in task demand, and this thus manipulating what one would expect to increase mental workload." (Alsuraykh et al., 2019, p. 4)

"Similar to performance, the lack of copying with the perceived demand and perceived capability will impact the cognitive appraisal, which in turn will induce the stress

response, that could be psychological and/or physiological [13]” (Alsuraykh et al., 2019, p. 4) How stress measurements influence WML that alsoinfluences stress

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1. a special form of stress, a specific or unspecific reaction pattern of the organism to external and interal stimulus events, that are caused directly or indirectly through technology, i.e. already through the design of technical tools, during the use of technical tools and through the general attitude and acceptance towards technical tools, and that disrupt the physical and psychological homeostasis as well as strain or exceed the ability to adapt or cope↩