Development and Validation of the Eustress Questionnaire

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Abstract

Background. Stress experiences are unavoidably in our everyday-life. Within research and press, stress is considered negative and its negative effects are exceedingly emphasized. The positive response to stress, called eustress, is much less researched. Eustress is a healthy, positive and constructive response to stressful events and can improve performance, health and well-being. Empirical research and a suitable scale to assess eustress are missing. The objective of this research was to develop and validate the Eustress Questionnaire (EQ) that can be used for empirical research. Therefore the psychometric properties factorial structure, internal consistency and convergent and discriminant validity were examined.

Methods. A quantitative cross-sectional survey design was conducted with 106 participants, with the scales measuring eustress, resilience, self-efficacy, social-, emotional- and psychological well-being, internal and external locus of control, depression and anxiety. The sample consisted of students from a Dutch university and their friends and relatives. Exploratory factor analysis and Pearson’s correlation was used to statistically analyse the data.

Results. The EQ was established to be an unidimensional scale with nine items and a good reliability. Weak positive correlations were found between emotional well-being and eustress and self-efficacy and eustress which is in line with the hypotheses and provides evidence for the convergent validity of the EQ. No correlations were found between eustress and social well-being, psychological well-being, resilience, internal locus of control, external locus of control, anxiety and depression. No support was found for the discriminant validity of the EQ.

Conclusion. The EQ displays a first short and reliable measurement instrument to assess eustress and provides a substantial starting point for empirical research on eustress. Some support was found for the construct validity of the EQ but additional research is needed to further examine its psychometric properties and improve the scale.

Keywords: Eustress Questionnaire, scale development, validation
Introduction

In our daily lives, everyone experiences stress, which emerges from for example interpersonal conflicts, work overload or examinations. People can respond in two different ways to stress, the negative response is called *distress* and the positive response is called *eustress*.

In research as well as in news, press and workplace, distress and its negative effects on mental and physical health has been highly and repetitively emphasised. It was shown, that over time, distress can have a negative impact on well-being, performance and physiological, psychological, and affective functioning (Quick, Wright, Adkins, Nelson & Quick, 2013; Crum & Lyddy, 2013). Furthermore, distress has been linked to for example negative emotions, strain, (Rodríguez, Kozusznik, & Peiró, 2013), relational conflicts, aggression (Bodenmann, Meuwly, Bradbury, Gmelch, & Ledermann, 2010) and burn-out (Hargrove, Becker & Hargrove, 2015).

Lazarus (1974) mentions that the experience of stress plays an important role in life to survive, grow and flourish. However, research on the positive nature of stress, called eustress, is rare and often ignored (Crum, Salovey & Achor, 2013). Even though, the existing eustress research suggests that eustress can have many advantages as for example enhanced: motivation, initiative-taking to acquire skills, self-efficacy (Fay & Sonnentag, 2002), proactive problem-solving, sense of mastery and a greater appreciation of life (Crum et al., 2013). Furthermore, the positive stress can make the body stronger and healthier as a result of the demanding experience, by enhancing physical recovery and immunity (Epel, McEwen, & Ickovics, 1998).

Crum et al. (2013) state that it is important to have more research on the positive response to stress because “this focus on the destructiveness of stress—this “stress about stress”—is a mindset that, paradoxically, may be contributing to its negative impact.” (p.716). This can increase the adoption of a so called stress-is-debilitating mindset which further can influence the stress response and stress related outcomes such as health and performance (Crum et al., 2013). A positive shift in our mindsets is needed and it is expected that eustress is linked to the so called stress-is-enhancing mindset (Crum et al., 2013). Therefore, it is important to better understand eustress and how it is related to well-being and performance. In this context, developing a scale to measure eustress will add value and extent the existing research on eustress. The purpose of this research is therefore to develop and validate a generic scale that focuses on the positive responses to stress namely eustress.
Theoretical framework

Stress
In order to understand how stress can affect physical and mental functioning, the concept of stress needs to be explained. Within the human body, the experience of stress leads to an activation of central and peripheral neuroendocrine mechanisms (Chrousos, 1998), and was originated to sufficiently meet the demands of survival by improving physiological and mental functioning of the body (Sapolsky, 1996). The stressful situation or stimuli to which the person responds, is called stressor (Simmons & Nelson, 2007). The physiological and neutral response to stress is releasing dopamine, adrenaline, cortisol and anabolic hormones, and fuelling the body and brain with more blood and oxygen (Park & Helgeson, 2006; Epel, McEwen, & Ickovics, 1998). This in turn can lead to states of narrowed attention, heightened alertness, and increased energy, arousal, performance, speed of cognitive tasks and memory (Cahill, Gorski, & Le, 2003; Hancock & Weaver, 2005).

The process that triggers the described physiological reactions is an evaluation process called cognitive appraisal. Therefore, stress can also be described as a process that occurs when the relation between a person and the situation is perceived and evaluated as challenging and personally significant for well-being (Folkman, 2013; Simmons & Nelson, 2007). People respond differently to a specific stressor depending on whether they appraise the stressor as positive or negative. When stressors are perceived as threatening, harmful, negative and adversarial to well-being we speak about negative appraisal (Simmons & Nelson, 2007). The negative response to it is the well-known distress (Simmons & Nelson, 2007; Lazarus, 1993; Colligan & Higgins, 2005). This negative response can entail for example burnout, anger, fear, anxiety and frustration (Simmons & Nelson, 2007). When stressors are perceived as positive, benefitting or enhancing well-being, we refer to positive appraisals (Simmons & Nelson, 2007; Lazarus and Folkman, 1984). Furthermore, when demands are perceived as challenges or opportunities that a person feels confident to overcome with available coping resources, this is also referred to as positive appraisals (Simmons & Nelson, 2007). Those stressors that are “appraised as promoting accomplishment of [...] tasks and the personal development of the individual” are called challenge stressors (Podsakoff, 2007, p. 87) and can also be accounted to positive appraisals. The positive stress response is referred to in the literature as eustress (Lazarus, 1974; Selye, 1975). The whole process can be seen in figure 1.
Eustress

Eustress can be defined as the healthy, positive and constructive response to stressful events (Quick, Quick, Nelson & Hurrel, 1997). The experience of eustress is described by individuals “as being totally focused in a mindful state of challenge, a healthy state of aroused attention on the task, exhilaration, and being fully present” (Hargrove et al., 2013). Furthermore, eustress can be described as a means to react to stressors with positive emotions such as hope, goodwill and vigor (Nelson & Simmons, 2011; Selye, 1987) and is “essential to growth, development, and mastery” (Quick, Cooper, Nelson, Quick, & Gavin, 2003, p. 5). Hargrove et al. (2013) state that the ultimate experience of eustress is flow “in which time suspends, individuals lose themselves in activity, and they perceive a great sense of control” (p. 67).

The rationale behind eustress is that everyone has an individual stress level under which he or she can perform at his or her optimum (Yerkes & Dodson, 1908). This means, that some stress is needed for the best possible outcome. However, this stress should be perceived as controllable and within one’s capacity to cope to result in positive outcomes (Yerkes & Dodson, 1908). In order to develop challenge and generate eustress, four components are important: appraisal, relatedness, task accomplishment and personal development (Hargrove et al., 2013). The first element, appraisal, was already discussed earlier. Whether a stressor is positive or negative depends on how the person appraises the stimulus. To generate eustress, this appraisal should be positive. This can be ensured by for example framing a task positively and expressing it in a positive emotional state (Hargrove et al., 2013). The second element, relatedness means that, for a stressor to be challenging, it has to “be appraised as being related to either task accomplishment or personal development” (Hargrove et al., 2013, p.65). This can be generated by for example demonstrating the purpose or value of the task, how demands are connected to outcomes and how the person is oriented in the broad context of a mission (Hargrove et al., 2013). The third and fourth element, task
accomplishment and personal development, are related to outcomes important to the individual. Task accomplishment means achieving a common purpose and personal development means achieving individual goals (Hargrove et al., 2013). To generate eustress, it is therefore important that the person contributes to a common purpose with the task and personally benefits from it (Hargrove et al., 2013).

Eustress can have advantages for the physical and mental health of the individual. Positive stress experience can boost physiological thriving by influencing underlying biological processes positively, which in turn leads to improved physical recovery and immunity (Crum et al., 2013). More specifically, anabolic hormones can be elicited which “rebuild cells, synthesize proteins, and enhance immunity, leaving the body stronger and healthier than it was prior to the stressful experience” (Crum et al., 2013, p.717). Researchers suggest that eustress can be positively associated with performance, physical health, well-being, engagement, organizational commitment and job satisfaction (Quick et al., 2013, Quick, Bennet & Hargrove, 2014; Simmons & Nelson, 2007; Hargrove et al., 2015). Moreover, research anticipates that experiencing eustress can lead individuals to states of savouring and flow and a better anticipation on future stressors (Hargrove et al., 2013).

It is important to mention that these suggestions and anticipations of eustress and its’ positive effects of research used in this study are often grounded on non-empirical research. Therefore, existing literature on eustress should be critically reviewed. For example, Hargrove et al. (2015) provide associations and conceptualizes the human resource development (HRD) eustress model on basis of existing organizational stress literature. Other studies formulated associations only on basis of related constructs such as stress-related growth (Crum et al., 2013), challenge stressors (Quick et al., 2014) or occupational stress (La Fevre et al., 2013). Moreover, some research formulated associations with eustress on basis of more general stress theories such as the holistic stress model (Nelson & Simmons, 2007; Nelson & Simmons, 2011; Hargrove et al., 2013) or the challenge hindrance framework (Hargrove et al., 2013). As a result, research on eustress lacks empirical evidence to allow speaking about significant correlations and suggested associations are too vague and need to be tested. Therefore the development of a scale to quantitatively measure eustress is important and will facilitate empirical research.
Differences between eustress and related constructs

In the literature about stress and eustress, the psychological constructs coping, stress mindset and stress-related growth can often be encountered. Coping can be defined as “the process of appraising threat and mobilizing cognitive and behavioural resources to combat stress when it does occur” (Crum et al., 2013, p. 718). Coping is therefore about thoughts and actions an individual takes to manage a stressful situation which can be appraised as threatening or positive and enhancing (Lazarus, 1993). Such as eustress, coping is a response to stress. However, coping differs from eustress as it takes place at the appraisal phase and drives the responses to stress by managing and preventing difficult situations (Crum et al., 2013).

Stress mindset seems to be an additional construct related to eustress. Stress mindset can be described as the expectations and attributes ascribed to stress whether the individual feels distressed or not (Crum et al., 2013). This construct refers thus to the evaluation of the nature of stress itself as threatening or beneficial and is associated with more general motivational and physiological processes related to stress experiences (Crum et al., 2013). The stress mindset that seems to be correlated with eustress is called the stress-is-enhancing-mindset and has to do with acceptance and utilization of stress to achieve outcomes (Crum et al., 2013). This mindset differs from eustress as it refers to a more general cognitive attitude towards stress and can influence the experience of eustress.

Finally, stress-related growth is the process that describes a positive change (growth) of individuals after stressful experiences (Crum et al., 2013). This change can improve mental toughness, heightened awareness, new perspectives, a sense of mastery, strengthened priorities, deeper relationships, greater appreciation for life, and an increased sense of meaningfulness (Crum et al., 2013). The difference to eustress is, that stress-related growth is independent from the appraisal of the stressor whereas eustress is dependent on a positive appraisal of a stressor. Furthermore, stress-related growth can be described as an outcome of stress, whereas eustress is a response to stress.

Research purpose

Contrary to the most research in the area of stress, this study will focus on the positive side of stress namely eustress, which needs more empirical foundation. The purpose of the current research is to develop a generic scale to quantitatively measure eustress by assessing the psychometric properties factorial structure, internal consistency and convergent and discriminant validity of this scale in a non-clinical sample. Therefore, associations between
eustress and related concepts will be determined to provide support for the validity of the developed eustress scale. To assess the validity of the scale, hypotheses have been formulated.

**Construct validity**

_Convergent validity_

Based on research, it is expected that eustress is positively related to psychological, emotional and social well-being, resilience, internal locus of control and self-efficacy. Research has suggested positive associations between psychological well-being and eustress (Nelson & Simmons, 2007; Hargrove et al., 2013). Psychological well-being focuses on individual fulfilment and corresponding elements are: self-acceptance, purpose in life, autonomy, positive relations with others, environmental mastery and personal growth (Westerhof & Keyes, 2009). Furthermore, a positive association can be assumed between eustress and emotional well-being, which includes aspects as life satisfaction and positive feelings like happiness and interest in life (Keyes, 2007) and is positively associated with positive emotions and job satisfaction (Nelson & Simmons, 2011). Moreover, as eustress seems to be positively linked with commitment and engagement behaviour (Quick et al., 2014; Hargrove et al., 2015), a positive association between eustress and social well-being can be assumed. Social well-being focuses on optimal functioning in society and corresponding elements are social coherence, acceptance and integration (Westerhof & Keyes, 2009). Moreover, eustress seems to be positively correlated with resilience. Resilience can be described as the ability to endure and adapt to stressful situations and changes (Block & Kremen, 1996). Research has shown that resilience can lead to a better adaptability and a more positive reaction (Fletcher & Sarkar, 2013) to stressors and thus may influence the development of eustress. The internal locus of control can be described as the extent to which a person views actions and events caused by themselves (Rotter, 1966). Research has shown that individuals with an internal locus of control hold the belief that they have the necessary resources to cope with stressful situations and appraise these rather as an opportunity than as threat (Nelson & Simmons, 2011). As a result, it is expected that internal locus of control is positively correlated with eustress. Finally, according to Bandura (1995) also individuals with high levels of self-efficacy are more likely to view stressors as a challenge rather than as a threat and are more likely to react motivated to stressful situations. Therefore, a positive correlation between eustress and self-efficacy is expected. As a result, the following hypotheses have been formulated to assess the convergent validity of the new eustress scale:
**H1**: Eustress correlates positively with psychological well-being.

**H2**: Eustress correlates positively with social well-being.

**H3**: Eustress correlates positively with emotional well-being.

**H4**: Eustress correlates positively with resilience.

**H5**: Eustress correlates positively with internal locus of control.

**H6**: Eustress correlates positively with self-efficacy.

**Discriminant validity**

Grounded on existing research, it is expected that eustress is negatively related to external locus of control, anxiety and depression. The external locus of control can be described as the extent to which a person views actions and events caused by others and beyond their control (Rotter, 1966). Research has shown that individuals with an external locus of control are more likely to appraise a stressful situation as a threat as they hold the belief that they have little control over the outcomes and do not have the necessary resources to cope with the situation (Nelson & Simmons, 2011). Therefore, it is expected that external locus of control is negatively correlated with eustress. Furthermore, research anticipates positive associations between eustress and social, emotional and psychological well-being and positive emotions (Nelson & Simmons, 2007; Nelson & Simmons, 2011; Quick et al., 2014; Hargrove et al., 2015). Therefore, the opposite, namely negative correlations between anxiety and depression and eustress are assumed. This means that it is expected that for people who experience eustress, anxious and depressive feelings are less likely to occur. As a result, the following hypotheses have been formulated to assess the discriminant validity of the new eustress scale:

**H7**: Eustress correlates negatively with external locus of control.

**H8**: Eustress correlated negatively with anxiety.

**H9**: Eustress correlates negatively with depression.
Method

Design
To examine and explore the variables and the associations among, the current research used a quantitative cross-sectional research design. This research design is appropriate to determine the prevalence of the concerned outcomes (Mann, 2003) and to highlight associations of factors within a specific population at a given time point (Pearl, 2009). Furthermore within a cross-sectional research design, data can be acquired in a short time period, little resources are required and it is cost-effective (Mann, 2003).

Participants
The participants were recruited via convenience sampling. Participants had to be at least 18 years old and sufficient English reading skills to complete the survey. In total 135 participants completed the questionnaire. Participants who did not fully complete the questionnaire were deleted from the data set, which led to a reduction of 27 participants. Furthermore, the data distribution was explored using box plot which showed one outlier. Further investigation of the outlier showed that there was no variance in the answers and therefore this participant was removed from the dataset. The used sample for this research thus consisted of 106 participants.
between the ages 18 to 59 of which 42.5% were men and 57.5% were women. The general demographical characteristics of the sample are shown in table 1.

Table 1

Demographical Characteristics of the Participants (N = 106)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>45</td>
<td>42.5</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>61</td>
<td>57.5</td>
</tr>
<tr>
<td>Age</td>
<td>18 - 19</td>
<td>2</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>12</td>
<td>11.3</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>23</td>
<td>21.7</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>9</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>11</td>
<td>10.4</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>6</td>
<td>5.7</td>
</tr>
<tr>
<td></td>
<td>26 - 59</td>
<td>26</td>
<td>24.5</td>
</tr>
<tr>
<td>Current Occupational Status</td>
<td>Student</td>
<td>68</td>
<td>64.2</td>
</tr>
<tr>
<td></td>
<td>Employed for wages</td>
<td>31</td>
<td>29.2</td>
</tr>
<tr>
<td></td>
<td>Self-employed</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>3</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>3</td>
<td>2.8</td>
</tr>
<tr>
<td>Highest educational qualification</td>
<td>Vocational education</td>
<td>3</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>Secondary Education</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Higher Secondary Education</td>
<td>68</td>
<td>64.2</td>
</tr>
<tr>
<td></td>
<td>Bachelor’s Degree</td>
<td>21</td>
<td>19.8</td>
</tr>
<tr>
<td></td>
<td>Master’s Degree</td>
<td>13</td>
<td>12.3</td>
</tr>
</tbody>
</table>

Procedure

After ethical approval by the University of Twente, the data were collected in March and April 2017. The link to the survey which was developed and shared with Qualtrics, was distributed via WhatsApp, Facebook and face-to-face interactions by the research assistants. When participants followed the link, first general information was shown about goal and purpose of this research. Second, agreement on the informed consent was asked. Participation in this research was totally anonymous and voluntary.

In the first part of the survey, demographical questions like age, sex and occupational status were asked. The following parts of the survey consisted of scales measuring different
psychological constructs. As this research was part of a larger study, some included questionnaires are not referable to the variables in this research. In total, the survey consisted of 197 questions from nine different scales. For this research the following scales were used: Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983), Levenson Multidimensional Locus of Control Scale (Levenson, 1973), Mental Health Continuum Short Form (MHC-SF) (Keyes, 2009), General Self Efficacy (GSE) (Schwarzer & Jerusalem, 1995), Resilience scale by Block and Kremen (1996), the LOT-R (Scheier, Carver & Bridges, 1994) and the new developed eustress scale. On average, the duration to fill in the survey accounted 35 to 45 minutes. At the end of the survey, interested participants could leave their email addresses to receive further information about the study and its outcomes.

Measuring instruments

Mental well-being: Mental well-being was measured using the fourteen-item questionnaire Mental Health Continuum Short Form (MHC-SF). This survey is based on the three components of well-being, emotional-, psychological- and social well-being (Lamers et al., 2011). Respondents indicated how often they experienced or felt the presented situation/feeling in the past month. Items were rated on a seven-point Likert scale (0 = never, 5 = every day). A sample item is: ‘During the past month, how often did you feel happy?’.

Anxiety and depression: The Hospital Anxiety and Depression Scale (HADS) is a four-point Likert scale that measures the degree of anxiety and depression. It contains a depression and an anxiety scale that each consists of seven items. A sample item for anxiety is: ‘I feel tense or ‘wound up’ (3 = most of the time, 0 = not at all) . A sample item for depression is: ‘I look forward with enjoyment to things’ (3 = As much as I ever did, 0 = Hardly at all to things in advance). The anxiety scale showed an excellent reliability with a Cronbach’s alpha of .80 and the Cronbach’s alpha .76 was acceptable for the depression scale (Spinning et al., 1997). Cronbach’s alpha within the current research was .76 for the anxiety scale and .70 for the depression scale, which both can be assigned as having an acceptable reliability.
**Resilience:** Resilience was measured using the fourteen-item Ego-Resiliency scale (ER89) developed by Block and Kremen (1996). Items on the ER89 were rated on a four-point Likert scale (1 = does not apply at all, 4 = applies very strongly). A sample item is: ‘I am generous with my friends’. The ER89 shows acceptable reliability with a Cronbach's Alpha of .76 (Block & Kremen, 1996). This scale has also an acceptable reliability within the current research with a Cronbach’s alpha of .73.

**Locus of Control:** Locus of control was measured with the Levenson Multidimensional Locus of Control Scale (IPC LOC) developed by Levenson (1993). This scale contains three subscales with each eight items. Items are rated on a six-point Likert-scale (-3 = strongly disagree, 3 = strongly agree). A sample item for the subscale internal locus of control is: ‘When I make plans, I am almost certain to make them work’. The subscale external locus of control is comprised of the subscales ‘powerful others’ and ‘chance’. A sample item of the subscale ‘powerful others’ is: ‘My life is chiefly controlled by powerful others’. A sample for the subscale ‘chance’ is: ‘When I get what I want, it’s usually because I’m lucky’. The three subscales showed acceptable reliability with Cronbach’s alpha of .74 for internal locus of control, .79 for powerful others, and .79 for chance. (Kourmousi, Xythali & Koutras, 2015). In the current research, Cronbach’s alpha for the scale internal locus of control was .68, for the scale powerful others .68 and for the scale chance .67, which all can be assigned as questionable.

**Self-efficacy:** Self-efficacy was assessed with the General Self-Efficacy scale (GSE) developed by Schwarzer and Jerusalem (1997). This scale consist of in total ten items that are rated on a four-point Likert scale (1= not at all true, 4 = exactly true). A sample item is: ‘I can always manage to solve difficult problems if I try hard enough’. The GSE has an acceptable to excellent reliability with Cronbach's alpha between .76 and .90 (Schwarzer & Jerusalem, 1995). Cronbach’s alpha for this scale in the current research was good with .88.

**Scale construction**
Initially, in discussion with different researchers a pool of 50 items was constructed within a brainstorm-moment to capture the concept of eustress. Based on the literature, two researchers constructed a set of criteria (Appendix A) to eliminate items that seemed to be too similar to other items or which seemed to not measure eustress (face validity). This discussion and elimination-process led to a remaining number of 34 items which were considered in the data-
analysis. To answer the questions, respondents indicated how often they experienced a presented situation. Items were rated on a six-point Likert scale (1 = never, 2 = almost never, 3 = sometimes, 4 = often, 5 = almost always, 6 = always). A sample item is ‘In the last month, how often have you felt that stress enhanced your performance and productivity?’. Exploratory factor analysis was used to test different factor solutions and analyse factor loadings to determine the number of items and the factor structure.

Exploratory factor analysis
For statistical analysis IBM SPSS Statistics version 24.0 was used (IBM Corporation, 2017). In this research factor analysis (maximum likelihood) with oblique rotation was used to explore the number of items and the factor-structure of the eustress-scale. As indicators for factors, Eigenvalues (> 1) and the scree-plot were used. Furthermore, factor-loadings below +-.35 were suppressed (Costello & Osborne, 2005). Hence, items with lower factor-loadings were deleted. To indicate the suitability of the data for structure analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett’s test was used.

Reliability analysis
In order to test the internal consistency of the newly developed eustress scale a reliability analysis was conducted. A Cronbach’s alpha higher than .70 can be confirmed as reliable and acceptable (Mallery, & George, 2003).

Construct validity
To examine the discriminant and convergent validity of the eustress-scale, the scale was correlated to theoretically related constructs. First, Skewness and Kurtosis have been calculated to check whether the data is normally distributed. Cut-off scores set by +1 and -1. Second, Pearson’s correlation analysis was conducted to detect the correlations between: Eustress and psychological well-being (H1); eustress and social well-being (H2); eustress and emotional well-being (H3); eustress and resilience (H4); eustress and internal locus of control (H5); eustress and self-efficacy (H6); eustress and external locus of control (H7); eustress and anxiety (H8); and eustress and depression (H9). According to Pearson’s interpretation, correlations between 0.1 and 0.3 are small, between 0.3 and 0.5 moderate, large when \( r > 0.5 \), and significant when \( p < .05 \) (Cohen, 1988).
Results

Exploratory factor analysis

KMO and Bartlett’s test revealed a good suitability of the date for factor analysis with a value of .86. Maximum likelihood analysis revealed the presence of seven factors with Eigenvalues exceeding 1, explaining 21.58%, 18.53%, 10.94%, 2.73%, 3.53%, 3.46% and 2.13% of the variance respectively. Analysis of the scree-plot revealed a clear break after the third factor. Therefore, it was decided to retain three factors for the second factor analysis according to Cattell’s (1966) scree test. Item 16 was deleted because of low factor loadings (< +.35).

This three-factor solution explained a total of 52.25% of the variance, with the first factor 1 explaining 35.51%, the second factor explaining 13.31%, and the third factor explaining 3.43% of the variance. For further interpretation oblimin rotation was used. A factor can be interpreted if at least 4 variables have a charge of ± .60 or more or if at least 10 variables have a charge of ± .40 or more (Klopp, 2010). As a result, the third factor could not be interpreted and a two-factor solution was forced.

The two-factor solution explained 49.41% of the total variance. The first factor (eigenvalue 13.21; 36.63% explained variance) comprised 25 items regarding different aspects of achievement/successful coping. The second factor (eigenvalue 4.53; 12.78% explained variance) comprised nine items regarding different aspects of eustress. Item 9 was deleted because of low factor loadings (< ± .35). The two factors show a number of strong loadings and all variables load considerably only on one factor. The items load positively on the factor achievement/successful coping and negatively on the factor eustress.

The results of the exploratory factor analysis are leading to an unidimensional eustress scale consisting of in total nine items. Therefore, a fourth factor analysis was performed with the nine items concerning eustress. Only one factor was found with an eigenvalue > 1 (Figure 3). This one-factor solution explained a total of 60.42% of the variance (eigenvalue 5.85). As a result, the 9-item scale was used for the further statistical analysis. The factor matrix of the scale with the factor loadings for each item can be seen in table 2. The final version of the new developed Eustress Questionnaire (EQ) can be found in appendix B.
Figure 3. Scree plot showing eigenvalues for each factor of the EQ.

Table 2

Factor Matrix of Factor Loadings Resulting From Maximum Likelihood Analysis With Oblimin Rotation

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the last month how often have you …</td>
<td>Eustress</td>
</tr>
<tr>
<td>1. Felt that stress enhanced your performance and productivity?</td>
<td>.77</td>
</tr>
<tr>
<td>2. Felt that stress improved your health and vitality?</td>
<td>.59</td>
</tr>
<tr>
<td>3. Felt that stress is positive and should be utilized?</td>
<td>.72</td>
</tr>
<tr>
<td>4. Felt that being under pressure made you think more clearly and focused?</td>
<td>.78</td>
</tr>
<tr>
<td>5. Felt that a stressful situation had a positive impact on you?</td>
<td>.73</td>
</tr>
<tr>
<td>6. Felt that being under pressure made you more productive?</td>
<td>.82</td>
</tr>
<tr>
<td>7. Felt motivated by your stress?</td>
<td>.79</td>
</tr>
<tr>
<td>8. Felt that being under pressure made you perform better?</td>
<td>.87</td>
</tr>
<tr>
<td>9. Felt that stress has a positive effect on your performance?</td>
<td>.89</td>
</tr>
</tbody>
</table>

Note. Factor loadings below .35 were suppressed.
Reliability analysis
The reliability analysis revealed a high Cronbach’s alpha of .93 for the eustress scale which can be assigned as excellent. Hence, the nine items of the scale are internal consistent.

Construct validity
The analysis of Skewness and Kurtosis displayed a normal data distribution of all scales is (+1 > skewness/kurtosis < -1) except the data of the GSE and the External-Locus scale. These two scales are normally distributed when it comes to Skewness. This means that the data is relative symmetric. However, Kurtosis for both scales shows a peaky distribution (kurtosis > +1), which conveys that the data of the scales is heavy-tailed and therefore highly concentrated around the mean.

Convergent validity
Pearson’s correlation showed a significant positive correlation between emotional well-being and eustress ($r = .21; p < .05$). Participants that showed higher scores on emotional well-being showed also higher scores on eustress, which is in line with hypothesis 3. Hence, people who experience eustress have a higher emotional well-being.

In line with hypothesis 6, a significant positive correlation was found between self-efficacy and eustress ($r = .28; p < .05$). Participants that showed higher scores on self-efficacy showed also higher scores on eustress. Hence, people with higher self-efficacy experience more eustress. No significant correlations were found between eustress and psychological-and social well-being, resilience and internal locus of control. Therefore, eustress seems not to be positively correlated with psychological well-being ($p > .05$), social well-being ($p > .05$), resilience ($p > .05$) and internal locus of control ($P > .05$). Thus, no support for hypothesis 1, 2, 4 and 5 was found. All correlations can be found in table 3.

Discriminant validity
Pearson’s correlation showed no significant correlations between eustress and external locus of control, anxiety and depression. Thus, eustress seems not to be negatively correlated with external locus of control ($p > .05$), anxiety ($p = > .05$) and depression ($p = > .05$). As a result, no support for hypothesis 7, 8 and 9 was found.
Table 3
*Means, standard deviations and correlations among eustress and the hypothesized variables.*

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
<th>9.</th>
<th>10.</th>
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</thead>
<tbody>
<tr>
<td>1. Eustress</td>
<td>3.98</td>
<td>1.04</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Emotional Well-being</td>
<td>4.56</td>
<td>.79</td>
<td>.21*</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Social Well-being</td>
<td>3.59</td>
<td>.94</td>
<td>.13</td>
<td>.42**</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Psychological Well-being</td>
<td>4.29</td>
<td>.79</td>
<td>.01</td>
<td>.62**</td>
<td>.56**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Resilience</td>
<td>3.00</td>
<td>.46</td>
<td>.15</td>
<td>.47**</td>
<td>.42**</td>
<td>.57**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Internal Locus of Control</td>
<td>4.38</td>
<td>.60</td>
<td>.09</td>
<td>.39**</td>
<td>.39**</td>
<td>.43**</td>
<td>.50**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. General Self-Efficacy</td>
<td>2.99</td>
<td>.46</td>
<td>.28**</td>
<td>.32**</td>
<td>.33**</td>
<td>.46**</td>
<td>.55**</td>
<td>.43**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Anxiety</td>
<td>2.55</td>
<td>.35</td>
<td>-.18</td>
<td>-.57**</td>
<td>-.12</td>
<td>-.35**</td>
<td>-.28**</td>
<td>-.29**</td>
<td>-.43**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Depression</td>
<td>2.25</td>
<td>.24</td>
<td>-.06</td>
<td>-.70**</td>
<td>-.31**</td>
<td>-.51**</td>
<td>-.38**</td>
<td>-.37**</td>
<td>-.36**</td>
<td>-.61**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. External Locus of Control</td>
<td>3.01</td>
<td>.59</td>
<td>-.02</td>
<td>-.18</td>
<td>-.17</td>
<td>-.22*</td>
<td>-.09</td>
<td>-.23*</td>
<td>-.18</td>
<td>-.26**</td>
<td>-.14</td>
<td></td>
</tr>
</tbody>
</table>

*Note. **. Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).*

**Discussion**

The aim of this research was to develop a scale to quantitatively measure eustress and assess its’ psychometric properties, factor structure, internal consistency, and discriminant and convergent validity. As a result, the Eustress Questionnaire (EQ) was developed, which consists of nine items that can be rated on a six-point Likert scale. This research contributes to existing research about eustress by offering an initial scale with formulated items to measure eustress. As a result, the current research makes the first attempt to empirically measure eustress. Moreover, results of the current research add to findings of previous research (Nelson & Simmons, 2011) by showing a significant correlation between eustress and emotional well-being. Furthermore, new findings can be added to the eustress literature as a significant positive correlation was found between eustress and self-efficacy. This correlation
was anticipated as research showed that high levels of self-efficacy can be linked to the appraisal of stressors as challenging rather than threatening (Bandura, 1995).

**The Eustress Questionnaire**

The results of the exploratory factor analysis indicated that the EQ is a unidimensional scale with in total nine items. These items ask whether a person had the feeling that stress/pressure is positive and improved performance, productivity, health, vitality and motivation. In the literature, eustress is described as a healthy, positive and constructive response to a stressor which is appraised as positive (Quick et al., 1997; Hargrove et al., 2013). The new developed EQ therefore seems to capture a great part of aspects of eustress as it is described in the literature. Furthermore, the reliability analysis revealed that the scale has an excellent reliability, which means that the items of the scale are internal consistent.

The analysis of the Pearson’s correlations revealed a small positive correlation between the new eustress questionnaire and a measure of emotional well-being. This result is in line with assumptions of previous research stating that eustress seems to be positively associated with positive emotions as hope, goodwill, vigor and satisfaction (Nelson & Simmons, 2011). Additionally, a small positive correlation was found between a measure of general self-efficacy and the new eustress questionnaire. This is in line with suggestions of Bandura (1995) who stated that individuals with higher self-efficacy are more likely to react motivated to stressful situations and view stressors as a challenge rather than a threat. Therefore small evidence was found for the convergent validity of the scale.

Nevertheless, more hypotheses were formulated to support the convergent validity of the EQ and correlations among eustress and the variables social- and psychological well-being, resilience, internal locus of control were all in the expected positive direction but none of them was significant. Based on previous research, it was expected that eustress is positively associated with social and psychological well-being due to suggested positive links between eustress and commitment and engagement behaviour (Quick et al., 2014; Hargrove et al., 2013) and personal grow and fulfilment (Hargrove et al. 2013; Nelson & Simmons, 2007). Moreover a positive association between eustress and resilience was expected due to research showing that resilience can make people react more positive and adaptive to stressors (Fletcher & Sarkar, 2013). Lastly, a positive association between eustress and internal locus of control was expected because research showed that individuals with an internal locus of control appraise a stressor as challenging and feel able to cope with it (Nelson & Simmons, 2011).
Additionally, also hypotheses were formulated to test the discriminant validity of the EQ. A negative association was expected between eustress and anxiety and depression due to the anticipated positive correlations of eustress with social, emotional and psychological well-being and positive emotions (Nelson & Simmons, 2007; Nelson & Simmons, 2011; Quick et al., 2014; Hargrove et al., 2015). These correlations were in the expected negative direction but also not significant. The correlation between eustress and external locus of control was not significant but positive. This is contradicting to the expectations of previous research suggesting that whether a person believes that failure or success is beyond his/her own control may hinder the experience of eustress (Nelson & Simmons, 2011). Accordingly no evidence for the discriminant validity of the EQ was found.

As a result, existing research indicates that the chosen constructs are appropriate to assess the construct validity of the EQ. The poor content validity of the EQ can be an explanation why the expected associations could not be found. Hence, the scale is not fully measuring what it claims to measure, namely eustress. The current EQ measures the aspects health, performance and positive appraisal. However, grounded on previous research it is expected that eustress encounters more than the three mentioned aspects as for example positive emotions (Selye, 1987), learning and growth (Quick, Cooper, Nelson, Quick, & Gavin, 2003). These aspects of eustress are missing in the current version of the EQ. It is therefore expected that associations with theoretically related constructs as for example resilience will be significant when the EQ fully covers all aspects of eustress.

**Limitations**

Several limitations of the present research should be noted. The first limitation concerns the sample and therefore the generalizability of this research. More than the half of the participants of this sample were students between 20 and 26 years old recruited in a Dutch university. Research has shown that students experience high levels of stress (Gibbons, Dempster. & Moutray , 2008; Ribeiro et al. , 2018). Therefore, results of this research cannot be seen as representative of the general population. As individuals experience eustress and distress in different life situations and especially related to work and career, future research should examine the results of the newly developed EQ within other samples too, as for example trainees and employees.

The second limitation concerns the methods used to assess the psychometric properties of the scale. To determine the reliability of the scale, Cronbach’s alpha was used. Cronbach’s alpha gives a good value of reliability of the scale with a specific sample at a single point in
time. Nevertheless, it is also important to check whether the scale is consistent over time in the same sample to assess the reliability (Guttmann, 1945). Therefore it is recommended to assess the test-retest reliability of the EQ by testing the scale twice at different times with the same sample.

The last limitation involves the item construction of the EQ. The initial item pool consisted of 50 items constructed in a brainstorm process to capture the concept of eustress. However, after approving for face validity, already 16 items were kept out of the data analysis as these seemed to not measure eustress. The exploratory factor analysis has shown that of the remaining 34 items, 25 items are more related to successful coping or achievement than eustress. All in all, the item construction therefore seemed not to be appropriate enough to capture the concept of eustress and should be more theoretically grounded. This could may explain the unexpected small amount of only nine out of 50 items that seem to measure eustress. This restricted item construction however, is possibly a result of the still small and inadequate amount of knowledge existing about eustress.

**Recommendations**

A more theoretically grounded item construction is therefore highly recommended. For this, it is suggested to be very accurately with the formulation of items. The nine items of the EQ are all concrete related to stress or pressure and display a response to stress, for example more productivity or motivation. For example, in the initial item pool, items included the variables growth and learning: ‘In the last month how often have you: Learned from coping with a difficult situation?’ or ‘Felt that handling a difficult situation made you grow as a person?’.

These items are related to a *difficult situation* which can be interpreted very differently. It is advisable to adjust these formulations and relate these more concrete to stress or pressure. Consequently, it would be clearer to participants that the questions are explicit about stress and pressuring situations. Reformulations could be: ‘Felt that a stressful situation made you grow as a person’ and ‘Felt that being under pressure had a learning effect?’.

It is expected that these new formulated items should load significantly on a factor concerning eustress. Accordingly a better content validity of the scale is expected.

Second, the validity of the questionnaire was measured by correlating the EQ with measures of theoretically related constructs, to assess the construct validity. As a result the validity was only theoretically examined but the important assessment of the predictive validity of the EQ is missing. Therefore it is recommended to assess the predictive validity of the EQ by validating test correlations with concrete outcomes. For example, measuring
whether a score on the EQ can predict performance and emotions during a stressful task or situation. It is expected that individuals who experience eustress perform better and react more positive than individuals who experience distress. Furthermore, it is recommended to further explore the construct validity of the scale, by correlating the scale with for example measures of distress. Research implies that eustress and distress can be associated with each other and are separate but related constructs (Rodríguez, Kozusznik, & Peiró, 2013; Simmons & Nelson, 2007).

Finally and as already mentioned, the EQ seems not to fully represent the concept of eustress and different aspects are still missing. The current EQ captures positive outcomes of eustress in form of improved performance, productivity, health, vitality and motivation. However, eustress can also be described as a means to react to stressors with positive emotions such as hope, goodwill, vigor (Selye, 1987) and is “essential to growth, development, and mastery” (Quick et al., 2003, p. 5). Therefore, to improve the scale items should be formulated and tested concerning the variables growth, learning and positive emotions.

**Conclusion**

In conclusion, this study reports the development and initial validation of the Eustress Questionnaire, a short and reliable measure to assess eustress. Little evidence was found for the convergent validity and no evidence was found for the discriminant validity of the EQ. Hence, it can be said that there is an indication of a reasonable validity for the EQ but it is not yet sufficient and it would be too premature to use the EQ. Additional research is needed to further examine its psychometric qualities and applicability and improve the scale. This research provides a solid starting point for further empirical exploration of the subject eustress, its causes and effects.
References


### Appendix A: Face validity criteria

<table>
<thead>
<tr>
<th>Item retained if it meets criteria A and at least one of the criteria from B.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Common criteria for all questions</strong></td>
</tr>
<tr>
<td>Related to a stressor (responsibility, difficult/stressful/demanding situation/task, changes, irritation, goal etc.)</td>
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</table>
Appendix B: The Eustress Questionnaire

**Instructions:**

Below is a list of questions about experiences with stress. Please indicate how often you experienced the presented feeling during stressful situations.

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Almost never</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost always</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Felt that stress improved your health and vitality?</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>2. Felt that stress is positive and should be utilized?</td>
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<tr>
<td>3. Felt that being under pressure made you think more clearly and focused?</td>
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<tr>
<td>4. Felt that a stressful situation had a positive impact on you?</td>
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</tr>
<tr>
<td>5. Felt that being under pressure made you more productive?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6. Felt motivated by your stress?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Felt that being under pressure made you perform better?</td>
<td></td>
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<td></td>
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<tr>
<td>8. Felt that stress has a positive effect on your performance?</td>
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