

EFFORT-REWARD IMBALANCE AT WORK IS PREDICTED BY TEMPORAL AND ENERGETIC CHARACTERISTICS OF BEHAVIOR: A POPULATION-BASED STUDY

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Abstract

Objective: Personality dispositions may influence perceptions of work stress. The paper examines the relationship between temperament in terms of Strelau's Regulative Theory of Temperament and the effort-reward imbalance and its components. **Material and Methods:** There were 890 participants (360 men) aged 37.9 years on average. Temperament traits of briskness and perseverance (temporal characteristics of behavior), sensory sensitivity, emotional reactivity, endurance and activity (energetic characteristics of behavior) were measured by Strelau & Zawadzki's Formal Characteristics of Behavior-Temperament Inventory (FCB-TI) in 1997 and 2001. Effort and reward at work were assessed with the original effort-reward imbalance (ERI) questionnaire of 2007. **Results:** Higher ERI at work was predicted by higher emotional reactivity, higher perseverance, lower briskness, and lower endurance. Higher effort and lower rewards at work were predicted by higher perseverance and lower endurance. The FCB-TI temperament characteristics accounted for 5.2%, 4.8% and 6.5% of the variance in the ERI, effort and reward, respectively. Lower emotional reactivity, lower perseverance, higher briskness and higher endurance predicted higher esteem at work, job promotion and job security. **Conclusions:** Individual differences in arousability, reflected in temporal and energetic characteristics of behavior, may predispose to or to protect from an effort-reward imbalance at work. Individual differences should be acknowledged in work stress prevention and developing interventions.

Key words:

Effort-reward imbalance, Emotional reactivity, Regulative Theory of Temperament, Temperament, Work stress

INTRODUCTION

Work is the prerequisite for an income as well as an important source of wellbeing. Although work can be satisfying and rewarding, it can also be a source of stress. Employees can be encumbered with both psychological and physical

demands at work. One of the leading scientific work stress theories, e.g. Siegrist's effort-reward imbalance (ERI) model which is based on social exchange theory, assumes that high efforts and low rewards are likely to elicit work stress in the majority of employees [1–3]. Efforts refer to

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work pressures and rewards to esteem, salary and career continuity. If effort is not rewarded, an effort-reward imbalance condition may occur, and is assumed to induce work stress in the majority of employees [2]. The main stream of work stress research has previously focused on the consequences of work stress [1,4,5]. However, individual characteristics may contribute to perception of effort and rewards at work [6,7].

Psychological stress is assumed to be caused by an imbalance between individual capacities and environmental demands. A stress state includes negative emotions, and stress brings on physiological and biochemical changes in the body [8,9]. There are individual differences both in perceptions of stress, i.e. appraisal of stressors and stress management [10,11], in physiological stress reactivity [12] and in recovering from stress [13]. Individual variation of the experience of stress may be related to differences in temperament [11,14,15]. Temperament refers in general to biologically-based, early emerging and relatively stable individual dispositions that reflect the reactivity to environmental stimuli, and the behavioural-emotional regulation of such reactivity [15]. Temperament traits are assumed to constitute antecedent conditions that influence subsequent conditions, and therefore, can be considered as moderators of all stress phenomena [15]. Temperament characteristics may predispose individuals to react differently in stressful encounters [7,10,11,16,17]. In arousal-oriented theories of temperament (e.g. The Regulative Theory of Temperament by Strelau) temperament traits are assumed to be stress moderators at extreme levels of stimulation [15]. Reactivity has a physiological basis and temperament traits are assumed to be determined by the level of arousal and their neurobiochemical mechanisms, and to be the principal moderator of the stimulating and temporal value of behaviours and reactions [18]. There are individual differences in arousability which, in turn, influence the preferred style of activity and effectiveness of performance [18].

The RTT model defines temperament as a collection of basic, relatively stable personality traits that apply mainly to the temporal and energetic characteristics of reactions and behavior [18]. Temperament is postulated to consist of six formal characteristics of behaviour that represent individual differences in temporal and energetic aspects of behaviour [19,20]. The temporal and energetic characteristics of behavior participate in the regulation of stimulation and the level of arousal which is disrupted in stressful situations [18]. Thus, temperament is postulated to participate in the regulation of individual-environment interaction, and is assumed to play an adaptive role in this process [15]. The temporal characteristics of behavior refer to the speed and tempo of reactions in regard to changes in the environment, and they are measured by the traits of briskness and perseveration. Briskness (BR) is a tendency to react quickly, to keep a high tempo in activities, and to shift from one behavior to another when necessary. Perseveration (PE) refers to continuation and repetition of behavior after cessation of stimuli requiring this behavior. The energetic characteristics of behavior represent physiological individual differences that define the energy level of the organism and temporal characteristics of behavior, the speed, tempo and mobility of nervous processes. The energetic aspects of behaviour refer to behaviour under stressors and risk-taking activity, and are measured by the traits of sensory sensitivity, emotional reactivity, endurance and activity. Sensory sensitivity (SS) is an ability to react to low value sensory stimuli. Emotional reactivity (ER) denotes intensive reactions to emotion-generating stimuli, expressed in low endurance of emotional stimuli and high emotional sensitivity. Endurance (EN) is an ability to react adequately in highly stimulating situations or in conditions of extensive environmental stimulation, i.e. in situations demanding prolonged activity. Activity (AC) refers to undertaking behaviors of high stimulative value.

There is some previous evidence on the influence of personality and temperament on work stress. Of the Big Five personality traits, higher neuroticism has been linked with higher work stress [21,22]. Regarding work stress indexed by ERI at work, higher eagerness-energy and hard-driving personality have been shown to predict higher ERI and higher effort at work [6]. Previously it has been reported that higher harm avoidance and lower novelty seeking, defined by Cloninger's temperament theory, predict perceptions of work stress [16]. High negative emotionality and activity, as defined by Buss and Plomin's temperament theory [23,24], have been shown to predict high perceived ERI and low rewards at work [7]. As yet, however, there is no information on associations between temperament characteristics in terms of the Regulatory Theory of Temperament (Strelau) and ERI.

The aim of our study was to examine whether RTT temperament traits, i.e. briskness, perseveration, sensory sensitivity, emotional reactivity, endurance and activity, predict perceived ERI and its components (effort and rewards). Thus far, the associations between RTT temperament traits and perceived ERI have not been studied. Based on previous evidence on the relationship between RTT temperament traits and stress [18,21], it is hypothesized that higher emotional reactivity, higher perseveration, lower briskness, lower endurance and lower activity predict higher ERI. The previous literature being so scarce, no hypothesis is proposed for sensory sensitivity and components of ERI.

MATERIAL AND METHODS

Subjects

The Young Finns Study (YFS) is an epidemiological, prospective follow-up study of a Finnish population [25,26]. A total of 3596 participants (aged 3 to 18-years) were at baseline in 1980. After 27 years of follow-up (in 2007), 61.2% of the original cohort was still participating in the study [27].

All participants gave written informed consent, and the study was approved by the local ethics committees.

The present subjects participated in the follow-ups of the Young Finns study in 1997, 2001 and 2007. It was required that participants have full information on all study variables. In 2007, 1585 participants reported working full time, and of those, 1574 reported effort and rewards at work in 2007. Of these participants, 890 participants had full data on age, gender, education, occupation and temperament traits in 1997 and 2001. The participants were on average 37.9 years old ($SD = 4.99$) in 2007, and 40.6% of the participants were men ($N = 360$).

Measures

Temperament

Temperament was assessed with the self-reported Formal Characteristics of Behavior Temperament Inventory (FCB-TI) by Strelau and Zawadzki [19,20], which includes 120 items (each trait comprising 20 items) rated in a yes = 1, no = 0 format comprised of temperament traits of briskness (e.g. "I am generally slower than others in carrying out my professional and domestic duties" reversed, "It's difficult for me to retain former proficiency if I have not practiced for a long time" reversed); perseveration (e.g. "When under stress I tend to repeat certain movements, e.g. tidying my hair, adjusting my clothes, rubbing my face", "After failures it takes a long time for me to pull myself together"); sensory sensitivity ("I can only smell strong smells" reversed, "The only spices I can taste while having a meal are the hot ones"); emotional reactivity ("I often breakdown in difficult moments", "I tend to make mistakes when working under pressure"); endurance ("I easily get tired if I have to work at something intensive" reversed, "I can continue working regardless of being tired"), and activity ("My social life is very active", "I try to organize my holidays to experience as much as possible"). The reliabilities of the FCB-TI scale temperament traits in 1997 and 2001 ranged from 0.7 to 0.8 (Cronbach's α).

Stability of RTT temperament traits from 1997 to 2001 ranged from $r = 0.60$ (SS) to $r = 0.76$ (ER). A mean score of two measurement points (1997 and 2001) was calculated to yield an index of temperament.

Effort-reward imbalance

In 2007, efforts and rewards at work were measured by the original scale [2]. The effort scale consisted of five items ($\alpha = 0.76$) and reward scale of 11 items ($\alpha = 0.82$). The components of rewards consisted of esteem (5 items, $\alpha = 0.85$), job promotion (4 items, $\alpha = 0.61$), and job security (2 items, $\alpha = 0.62$). Effort-reward imbalance was calculated as ratio between effort and reward as suggested by Siegrist [2]. A logarithmic transformation was then made for the effort-reward imbalance scale to correct for skewness and curtosis.

Control variables

The participants' education was reported by degree level in 2007. There were three occupational groups based on Central Statistical Office of Finland in 2001 and in 2007: 1) manual, 2) lower non-manual and 3) upper non-manual. Entrepreneurs were classified into these occupational groups according to level of education, that is, low = manual, intermediate = lower non-manual and high = upper non-manual.

Statistical analyses

The associations between temperament traits, effort, reward and ERI were examined by a series of linear regression analyses controlling for age, sex, education and occupation. In order to obtain a percentage of the degree to which temperament traits together account for the variation on effort, reward and effort-reward imbalance, analyses with all temperament traits included were run. There were no significant sex-temperament interactions on ERI or its components (p -values > 0.05), and therefore women and men were combined in the analyses.

RESULTS

The descriptive statistics of the sample are shown in Table 1. Attrition analyses showed that the included participants did not differ from excluded subjects in ERI, effort, reward, sensory sensitivity or activity (all p -values > 0.05). The participants were older (37.9 vs. 37.3, $p < 0.001$), and more educated (4.2 vs. 3.9, $p < 0.001$), had higher occupational status (2.2 vs. 2.0, $p < 0.001$), scored lower on perseveration (0.54 vs. 0.58, $p < 0.001$) and emotional reactivity (0.40 vs. 0.44, $p = 0.001$), and higher on briskness (0.81 vs. 0.79, $p = 0.001$) and endurance (0.56 vs. 0.51, $p < 0.001$) than the excluded subjects.

Table 2 presents the correlations between the study variables. Higher emotional reactivity was associated with lower level of education and lower occupational status. Higher activity was related to higher level of education and occupational status. Briskness and endurance correlated negatively, and perseveration, emotional reactivity and activity positively with ERI. Effort correlated positively with perseveration and activity, and negatively with endurance. Rewards were positively linked with briskness, endurance and activity, and negatively with perseveration and emotional reactivity.

The results of the linear regression analyses are presented in Table 3. They showed that higher perseveration and emotional reactivity predicted a higher effort-reward imbalance at work. Higher briskness and endurance predicted a lower effort-reward imbalance. Higher perseveration and activity, and lower endurance predicted higher effort at work. Temperament was related to rewards and its components so that higher briskness, endurance and activity, and lower perseveration and emotional reactivity predicted higher rewards and its components (esteem, job promotion and job security). Higher activity predicted perceptions of job promotion possibilities and job security. Sensory sensitivity was not related to ERI or its components.

Table 1. Descriptives of the study sample

Variable	Study participants [N = 890]				
	range	M	SD	n	%
Demographics in 2007					
age	30–45	37.91	4.99		
gender					
women				530	59.6
men				360	40.4
education					
comprehensive				23	2.6
upper secondary school				28	3.2
vocational school				272	30.6
college level education				211	23.7
higher vocational diploma				141	15.8
academic				215	24.2
occupation					
manual				269	30.2
lower non-manual				169	19.0
upper non-manual				452	50.8
Temperament 1997–2001					
briskness (BR)	0.18–0.98	0.81	0.12		
perseverance (PE)	0.05–1.00	0.54	0.18		
sensory sensitivity (SS)	0.28–1.00	0.80	0.12		
emotional reactivity (ER)	0.00–1.00	0.40	0.20		
endurance (EN)	0.03–1.00	0.56	0.20		
activity (AC)	0.03–0.90	0.42	0.19		
Effort-reward imbalance (ERI) and its components in 2007					
ERI	0.31–2.49	0.91	0.29		
ERI (log)	–0.51–0.40	–0.06	0.14		
rewards	1.36–5.00	3.72	0.61		
esteem	1.00–5.00	3.77	0.73		
job promotion	1.00–5.00	3.51	0.74		
job security	1.00–5.00	4.01	0.92		
effort	1.00–5.00	3.29	0.81		

M – mean; SD – standard deviation.

Table 2. Pearson correlations for study variables

Correlations	BR	PE	SS	ER	EN	AC
Age	0.04	-0.19***	0.03	-0.03	-0.05	-0.24***
Gender	0.14***	-0.28***	-0.16***	-0.37***	0.33***	0.07*
Education	-0.02	0.02	-0.00	-0.13***	-0.04	0.17***
Occupation	0.05	0.00	0.01	-0.11**	-0.01	0.13***
ERI	-0.10**	0.19***	0.00	0.14***	-0.14***	0.07
ERI (log)	-0.09**	0.20***	0.01	0.14***	-0.15***	0.08*
effort	-0.00	0.13***	0.03	0.01	-0.07*	0.16***
reward	0.18***	-0.16***	0.05	-0.25***	0.18***	0.11**
esteem	0.15***	-0.12**	0.04	-0.22***	0.15***	0.07*
job promotion	0.15***	-0.14***	0.03	-0.20***	0.16***	0.11**
job security	0.11	-0.13***	0.04	-0.15***	0.09**	0.07

* p < 0.05, ** p < 0.01, *** p < 0.001.
Abbreviations as in Table 1.

Table 3. Linear regression analyses on temperament and ERI controlling for age, gender, education and occupation

Trait	ERI			Effort			Reward		
	beta	p	%	beta	p	%	beta	p	%
Effort-reward imbalance (ERI) 2007 and its components									
briskness	-0.09	0.008	0.8	-0.01	0.779	0.0	0.17	< 0.001	2.9
perseverance	0.21	< 0.001	3.7	0.15	< 0.001	1.9	-0.16	< 0.001	2.3
sensory sensitivity	0.01	0.857	0.0	0.03	0.321	0.1	0.05	0.106	0.3
emotional reactivity	0.18	< 0.001	2.8	0.05	0.147	0.2	-0.27	< 0.001	5.8
endurance	-0.16	< 0.001	2.1	-0.07	0.034	0.5	0.19	< 0.001	3.1
activity	0.05	0.148	0.2	0.12	< 0.001	1.4	0.11	0.002	1.0
				Esteem			Job promotion		
The components of reward at work 2007									
briskness	0.15	< 0.001	2.2	0.14	< 0.001	1.9	0.11	0.001	1.2
perseverance	-0.13	0.001	1.4	-0.13	0.001	1.4	-0.14	< 0.001	1.6
sensory sensitivity	0.04	0.197	0.2	0.04	0.214	0.2	0.05	0.189	0.2
emotional reactivity	-0.25	< 0.001	5.1	-0.19	< 0.001	3.0	-0.15	< 0.001	2.2
endurance	0.17	< 0.001	2.5	0.16	< 0.001	2.3	0.08	0.012	0.7
activity	0.07	0.045	0.4	0.11	0.002	1.0	0.08	0.025	0.6

% = $\Delta r^2 \times 100$.

DISCUSSION

The aim of the present study was to examine the role of individual differences in perceptions work stress as assessed by effort-reward imbalance and its components. Higher perseveration, higher emotional reactivity, lower briskness and endurance predicted higher perceived work stress. Higher effort at work was predicted by higher perseveration and lower endurance. Higher rewards were predicted by higher briskness, higher endurance, and lower perseveration and lower emotional reactivity. Higher activity predicted both higher effort and higher rewards. The present results indicate that some temperamental characteristics may predispose the individual to work stress whereas some traits may increase resilience to stress at work.

Temperament-related sensitivity to work stress

Our hypothesis on the association between higher emotional reactivity and higher effort-reward imbalance was supported. This is in line with previous studies reporting that negative emotionality predicts higher ERI [7]. High emotional reactivity could increase stress sensitivity through a tendency to perceive stress more easily and also via inefficient stress management strategies. High emotional reactivity, in addition to other stress-related temperament traits, may increase the use of ineffective stress management styles [28–31]. Emotional reactivity has previously been related to increased use of emotion-focused, and decreased use of task-oriented stress management strategies [32]. Persons high in emotional reactivity tend to react intensely to emotional stimuli and their resilience to emotions is low, which may explain why it contributes to perception of an effort-reward imbalance. High emotional reactivity may predispose the person to stressful encounters in a work context and in its interactive systems [33]. Higher perseveration predicted a greater effort-reward imbalance. Perseveration refers to continuation and repetition of behavior after cessation of stimuli requiring this behavior. In regard to work stress, this behavioral tendency

of unnecessary repetition may increase the perception of stressors and lead to repetition of inefficient stress management styles. In a work context, high perseveration could lead to inefficient working styles and difficulties in prioritizing and working with less important tasks.

Temperament and resiliency to work stress

Our hypothesis on the association between lower activity and higher ERI was not supported. This is in line with a previous study showing that activity according to Buss & Plomin [24] did not predict work stress [7]. Instead, higher activity was linked with higher effort and rewards at work. This may imply that active employees may work with a brisk pace and engage themselves in higher efforts. At the same time, active employees may achieve set goals efficiently, and thus, be rewarded for good performance. We found that higher briskness and endurance predicted lower ERI. In addition, higher endurance predicted lower perceived efforts. The behavioral tendency of high briskness refers to reacting quickly, the ability to keep a high tempo in activities and to shift from one behavior to another when necessary. Higher endurance means the ability to react adequately in situations that require prolonged or high stimulating activity or in conditions of intensive external stimulation, e.g. not getting easily tired while working at something intensive and being able to continue working, regardless of being tired. Both these characteristics are likely to increase stress resilience in a work context that entails a large variety of demanding task- and people-related challenges. Higher briskness may be a beneficial behavioral tendency in frequently-occurring organizational changes as it may help quick adaptation to new situations. A tendency for higher endurance may increase resiliency to stressors and increase the potential for efficient stress management. Temperament seems to contribute to stress sensitivity and stress resiliency at work. An employee who is characterized by high emotional reactivity and high perseveration, and low briskness and low endurance could be sensitive to stressors

at work because of the use of ineffective stress management and working styles. An employee characterized by an opposed constellation of temperamental characteristics (high briskness and high endurance, and low emotional reactivity and low perseveration) could be resilient to stress at work due to not getting easily tired when working intensively, the use of more efficient stress management styles and the ability to adapt to new challenges at work.

The present results indicate that some temperamental traits may predispose a person to work stress while others could buffer against work stress. These associations may partly explained by divergent associations between temperament traits and components of ERI. We found that lower briskness was associated with higher ERI, and higher briskness with higher rewards. It is possible that working at a low tempo and having difficulties in shifting from one behavior to another (lower briskness) when necessary is likely to bring out perceptions of ERI due to lower level of achievement and efficacy, and thus, potentially lower rewards at work. Perseveration was positively related to ERI because it has a positive connection with effort and negative with reward. Perseveration, i.e. the tendency to repeat irrelevant behavior or certain movements when under stress may impair work performance, increase mismanagement of tasks and result in gaining fewer rewards, and thus, contribute to an effort-reward imbalance condition. Of the components of reward, higher perseveration was related to lower esteem reward, job promotion possibilities and perceptions of job security.

Temperament and rewards at work

Higher emotional reactivity and higher perseveration predicted lower rewards at work. Higher briskness, endurance and activity and lower emotional reactivity and perseveration predicted higher perceived esteem at work, perceptions of better job promotion possibilities and experience of better job security. These temperament traits may both increase resiliency to stressors and help in achieving rewards at work.

It is possible that these traits are reflected in the employees' behavior so that they are seen energetic, flexible, resistant to fatigue and active by the employers, who are likely to appreciate these characteristics in employees in general, and through that, be transformed in actual rewards at work. In our data (results not presented here) a high income level correlates with high briskness, high endurance, high activity, low emotional reactivity and low perseveration.

Limitations and methodological considerations

Some limitations should be taken into account when interpreting the present findings. First, temperament and work stress were obtained by self-report measures. Thus, both response style and temperament-related stress sensitivity may partly explain the present findings. There are, however, several important strengths in this study. Population-based data makes it possible to show the role of individual stress sensitivity in ERI and its components independent of age, gender, education and occupation. Our sample was representative of a wide variety of jobs and occupations, which increases the generalizability of the present findings. Work stress was measured with the original measure of effort-reward imbalance. This measure includes several sub-scales of rewards assessing different aspects of rewards (esteem, job promotion and job security), and thus, makes it possible to examine the individual differences in perceptions of different kind of rewards at work.

CONCLUSIONS

In conclusion, the present study shows that partly inherited, biological individual differences in arousability reflected in temporal and energetic characteristics of behavior contribute to work stress sensitivity. Whereas emotional reactivity and perseveration may predispose the individual to imbalance between efforts and rewards at work, briskness and endurance may protect the worker from ERI. The present results support our previous findings on individual

differences in perceptions of work stress and extend them to an alternative conceptual model of temperament, that is, the FCB-TI model. As individual differences in temperament are related to work stress, job-based interventions concentrating solely on characteristics of work, are likely to be of limited utility. Instead, a person-centered approach which considers individual differences in work stress is likely to be a more beneficial prevention and intervention strategy when promoting work performance, job satisfaction, stress management, and personnel wellbeing.

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