Pre-Analysis Plan for the stress-study part

Working title: “Perceived chronic stress and corporate culture – interdependencies and behavioral consequences

Martin Kocher[*] Lisa-Marie Schwanebeck[†] Christiane Schwieren[‡]

Abstract

This project is linked to “Consequences of Cooperation: Linking cooperative behavior and outcomes in a large-scale experiment”. In this study we want to examine how perceived chronic stress is related to corporate culture and cooperative behavior in a large multinational software corporation. By examining perceived chronic stress we want to analyze two different aspects. First, which conditions might lead to higher levels of perceived chronic stress? Second, giving the identification of determinants of perceived chronic stress, what are the consequences for cooperative behavior? This Pre-Analysis-Plan at hand gives an overview on our motivation, hypotheses, and anticipated empirical strategy.

[*] Institute of Higher Studies Vienna, University of Vienna and University of Gothenburg; email: kocher@ihs.ac.at.
[†] University of Heidelberg; email: lisa.schwanebeck@awi.uni-heidelberg.de
[‡] University of Heidelberg; email: christiane.schwieren@awi.uni-heidelberg.de

Motivation

Chronic stress is a growing public health problem in modern society. The ambition to comply with multiple requirements in a fast-moving environment comes along with conditions of persistent overloading more and more frequently. According to modern stress research (e.g. Schulz et al., 2004) the relevant factors that lead to such conditions are primarily to find in a professional (such as e.g. overwork, dissatisfaction, and excessive demands) and/or social background (such as e.g. social congestion, isolation, tensions, and lack of appreciation). Modern employers increasingly attempt to reduce some of these factors by means of their corporate culture. Measures, such as flexible working hours, home office, teamwork, and different incentive structures become therefore more and more important in working environment. However, the question how corporate culture is related to chronic stress has not been sufficiently clarified. Furthermore, there are still substantial lacks in our knowledge of the behavioral effects of chronic stress.

The literature on decision-making under chronic stress is scarce. One of the first studies in this field comes from Ceccato et al. (2016). The authors investigate the effects of chronic stress on financial risk-taking behavior, and find that chronic stress is significantly related to increased risk taking. For this purpose, chronic stress was measured via self-reported, i.e. perceived chronic stress, using the TICS questionnaire (Schulz et al., 2004), and via hair cortisol concentration. Interestingly, the effects are only in relation to self-reported chronic stress, whereas hair cortisol concentration was not conclusive as a measure. However, many studies have their focus on economic decision-making and social preferences under acute stress. In this regard, respective findings indicate two approaches of behavioral responses, which either are described as tend-and-befriend (Taylor, 2000) or fight or flight (Cannon, 1932). The fight or flight stress response is characterized by aggressive or escaping behavior, which is linked to selfish behavior in economic decision-making (FeldmanHall et al., 2015; Steinbeis et al., 2015). Instead, the tend-and-befriend response arise from a tendency to affiliate, and thus, is rather linked to pro-social behavior (von Dawans et al., 2012; Margittai et al., 2015; Sollberger et al., 2016). Despite the fact that the above-mentioned studies support different behavioral approaches, they indicate that physiological measures, such as cortisol, do not seem to affect decision-making. Instead, the findings indicate a correlation between self-reported stress and economic decisions. Hence, we will focus on self-reported, i.e. perceived chronic stress in our study in order to examine the aforementioned findings.

According to this, the main target of this study is to investigate potential sources which might lead to chronic stress and the effects of perceived chronic stress on cooperative behavior. We want to investigate this issue in the course of a professional environment, i.e. within a company and with regard to its corporate culture. Thereby we are especially interested to examine whether stressed employees behave according to the fight or flight or tend-and-befriend response, and how their behavior is related to corporate culture. For this purpose, we will also investigate the relation between stress perception and corporate culture on the

individual level. Furthermore, we are also interested to examine whether cooperative behavior/cooperative attitude might serve as stress buffer or stress trigger, depending on the cooperative norm in the company and social team background.

Strategy

Main variables

Cooperative behavior: according to our experimental and survey design we are able to identify different types of cooperative behavior. With respect to the stress-study part, we are especially interested whether perceived chronic stress is related to conditional contributions and unconditional contributions in the experiment. Furthermore, we are able to draw some cautious conclusions on pro-social behavior from the participants' willingness to donate.

Cooperative norm perception: As with cooperative perception, we want to picture the sense of cooperative culture in the company. For this purpose, we derive cooperative norm perception by means of norms and social norm perception regarding helping, information sharing, and teamwork in the company.

Perceived chronic stress: We will elicit chronic stress perception by means of the Trier Inventory for the Assessment of Chronic Stress (TICS). The TICS is a validated measure for self-reported chronic stress, which comprises nine different stress scales and consists of 57 Items. Due to time restriction within the experiment, we will use the short-form of the TICS, the screening scale for chronic stress (SSCS). The SSCS includes 12 of the most meaningful Items of the TICS, which cover five different sources of stress: chronic anxiety, work-related overload, social-related overload, excessive demand, and lacks of social appreciation. The SSCS offers the great advantage to generate a total score for perceived chronic stress. Thus, we are able to identify a continuum of perceived chronic stress.

Hypotheses

Hypothesis 1: *Perceived chronic stress is negatively correlated with perceived team cohesion*

> Hypothesis 1a: *Perceived chronic stress is positively correlated with competitive pressure*
>
> Hypothesis 1b: *Higher levels of perceived chronic stress are related to a lower assessed cooperative norm perception (descriptive and injunctive norm)*

Hypothesis 1 and 1a allows us to test, whether social support and social stressors within the team play a crucial role in the context of perceived chronic stress. Concerning this matter, there is a full body of literature, which refers to the adverse effects of absent social support at work (e.g. Cohen and Wills, 1985; Frese, 1989; Frese and Semmer, 1991; Schulz et al., 2004). Thus, we assume that low perceived team stability and team cohesion are related to higher stress levels in the SSCS-score. According to the literature on social stressors at work (e.g. Zapf and Frese, 1991), we can assume that negative competitive pressure increases the

likelihood of social tensions in the team. Hence, we assume that higher levels in the SSCS are related to negative competitive pressure.

> **Hypothesis 1b** here, we want to examine whether perceived chronic stress is limited only to the employee's team-background, or if it is also linked to the general cooperative norm in the company. Hence, a low cooperative norm perception might serve as indicator that company culture is rather characterized by "lone warriors" than "team-workers", what in turn also could be a potential source of social stress.

Hypothesis 2: *Perceived chronic stress is correlated with the employee's performance*

This hypothesis allows us to investigate the relation of stress-level and employee performance within two directions: For one, whether perceived chronic stress is an accompanying symptom regarding high-performing employees, what could be an indicator for work-related overload (Schulz et al., 2004). Instead, a negative correlation would indicate that higher levels of stress are related to lower employee performance. This direction also makes sense with respect to the adverse effects of chronic stress regarding mental and physical health (e.g. Ganster and Rosen, 2013; Morgado et al., 2015).

> Hypothesis 3: *The effect of perceived chronic stress on the employee's performance depends on the nature of competitive pressure within the team: positive competition increases performance, negative competition decreases performance.*
>
> From the literature on acute stress, we also know that positive stress (such as e.g. motivating competition) leads to higher performance, whereas negative stress (such as e.g. competitive pressure as social stressor) decreases performance. We want to investigate these findings also with respect to chronic stress. We will test for interactions between perceived chronic stress and the nature of competitive pressure within the employee's team.

Hypothesis 4: *Perceived chronic stress is negatively correlated with received awards/incentive structure*

According to the literature on social support at work (e.g. Frese, 1989, Schulz, 2004), lacks in social appreciation are relevant factors for stress perception. We want to investigate this issue with respect to the company's incentive structure. The incentive structure thereby leans on team-, and individual incentives, which are received either in a monetary or non-monetary form. We will focus on individual monetary incentives. Hence, a negative correlation between stress perception and the employee's amount of received awards could be an indicator for stress through a lack of social appreciation.

Hypothesis 5: *Perceived chronic stress is correlated with cooperative behavior*

We formulate Hypothesis 5 cautiously. Due to the scarce literature in this field, we are not assuming any causal link or even direction of correlation. However, as already mentioned there are several studies regarding economic decisions under acute stress (von Dawans et al., 2012; FeldmanHall et al., 2015; Margittai et al., 2015; Sollberger et al., 2016, Steinbeis et al., 2015) which indicate either a tend-and-befriend (pro-social) or fight or flight (selfish) response to acute stress. With this hypothesis, we aim to test for both, the tend-and-befriend, and fight or flight pattern with respect to perceived chronic stress. According to the tend-and-befriend pattern, stressed decision makers should show a tendency for more cooperation. A higher tendency especially for unconditional contributions in the public goods game would be a very good indicator for this pattern. A fight or flight response instead should show a low tendency for cooperation, what might be characterized by a higher tendency for free riding in the public goods game.

Hypothesis 5a: *Perceived chronic stress has different implications for cooperative behavior among males and females*

There is a broad consensus in modern stress research that males and females differ in their behavioral response to stress. According to Taylor et al. (2000) and Taylor (2006), the tend-and-befriend response is related rather to women's behavior, whereas males tend more to a fight or flight response under stress. However, recent studies have tried to investigate this assumption with respect to the economic decisions of males immediately after acute stress exposure. Von Dawans et al. (2012) find evidence for increasing pro-social behavior, as well as Sollberger et al. (2016), and Margittai et al. (2015). Counterevidence comes from Steinbeis et al. (2015), as well as Vinkers et al. (2013) who find tendencies, which rather indicate a fight or flight response among males. In turn, Nickels et al. (2017) find evidence for gender differences among males and females, which indicate a tend-and-befriend response for females and fight or flight response for males. We want to examine these contradictory findings in our analysis. Due to the fact, that studies as Margittai et al. (2015) and Vinkers et al. (2013) differ in their methodological approach, it is difficult to derive related assumptions for our study. Hence, we will follow the findings of Taylor et al. (2000), Taylor (2006) and Nickels et al. (2017). According to that, stressed females in our sample should show increasing cooperative tendencies, whereas stressed males should show decreasing cooperative tendencies.

Hypothesis 5b: *The impact of perceived chronic stress on cooperative behavior depends on the cooperative norm perception*

This hypothesis is formulated very cautiously. It allows us to test whether the nature of cooperative behavior, i.e. “tend and befriend” (pro-social) or “fight or flight” (selfish/isolation) depends on the assessment of cooperative attitude. In particular, we are interested whether participants who perceive the cooperative attitude within the company to be low, have tendencies for a fight or flight behavior in the public goods game, but show a tend-and-befriend response in donation behavior. This would be a very interesting indicator for a potential direct linkage between the nature of stress response and corporate culture.

Hypothesis 6: *Perceived chronic stress is correlated with the belief about others cooperative behavior*

With respect to the effects of acute stress on trust and trustworthiness (von Dawans et al., 2012; Steinbeis et al., 2015) our aim is to establish a potential correlation between the participants’ stress perception and their beliefs about others cooperative behavior in the public goods game. Von Dawans et al. (2012) find that acute stress is related to increasing trust and trustworthiness. Hence, we could assume that employees with a higher SSCS-score expect higher contributions from their team players on average than employees with lower SSCS-scores. However, Steinbeis et al. (2015) find opposite effects. According to that, the other direction seems to be plausible as well.

References

Cannon, W.B. (1932). *The wisdom of the body*. New York: Norton.

Ceccato, S.; Kudielka, B.M.; Schwieren, C. (2016).Increased Risk Taking in Relation to Chronic Stress in Adults. *Frontiers in Psychology,* 6:2036.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological bulletin*, 98(2), 310.

FeldmanHall, O.; Raio, C.M.; Kubota, J.T.; Seiler, M.G.; Phelps, E.A. (2015). The effects of social context and acute stress on decision making under uncertainty. *Psychological Science*, 26(12): 1918-1926.

Frese, M. (1989). Gütekriterien der Operationalisierung von sozialer Unterstützung am Arbeitsplatz. *Zeitschrift für Arbeitswissenschaft,* 43:112-122

Frese, M., & Semmer, N. (1991). Stressfolgen in Abhängigkeit von Moderatorvariablen: der Einfluss von Kontrolle und sozialer Unterstützung. *Psychischer Streß am Arbeitsplatz,* 135-153.

Ganster, D.C.; & Rosen, C.C. (2013). Work Stress and Employee Health: A Multidisciplinary Review. *Journal of Management,* 39(5): 1085-1122.

List, J.; Shaikkh, A.M.; Xu, Y. (2016). Multiple Hypothesis Testing in Experimental Economics. *NBER Working Paper No. 21875*.

Margittai, Z.; Strombach, T.; van Wingerden, M.; Joëls, M.; Schwabe, L.; Kalenscher, T. (2015). A friend in need: Time-dependent effects of stress on social discounting in men. *Hormones and Behavior,* 73:75-82.

Morgado, P.; Sousa, N.; Cerqueira, J.J. (2015). The Impact of Stress in Decision Making in the Context of Uncertainty. *Journal of Neuroscience Research,* 93:839-847.

Nickels, N.; Kubicki, K.; Maestripieri, D. (2017). Sex Differences in the Effects of Psychosocial Stress on Cooperative and Prosocial Behavior: Evidence for 'Fight or Flight' in Males and 'Tend and Befriend' in Females. *Adaptive Human Behavior and Physiology,* 3:171-183.

Schulz, P.; Schlotz, W.; Becker, P. (2004). *Trierer Inventar zum chronischen Stress: TICS*. Hogrefe.

Sollberger, S.; Bernauer, T.; Ehlert, U. (2016). Stress influences environmental donation behavior in men. *Psychoneuroendocrinology,* 63: 311-319.

Steinbeis, N.; Engert, V.; Linz, R.; Singer, T. (2015). The effects of stress and affiliation on social decision-making: Investigating the tend-and-befriend pattern. *Psychoneuroendocrinology,* 62:138-148.

Taylor, S.E. (2006). Tend and Befriend: Biobehavioral Bases of Affiliation Under Stress. *Current Directions in Psychological Science,* 15: 273-277.

Taylor, S.E., Cousino Klein, L.; Lewis, B.P.; Gruenewald, T.L.; Gurung, R.A.R.; Updegraff, J.A. (2000). Biobehavioral Responses to Stress in Females: Tend-and-Befriend, not Fight-or-Flight. *Psychological Review,* 107(3): 411-429.

Vinkers, C. H.; Zorn, J. V.; Cornelisse, S.; Koot, S.; Houtepen, L. C.; Olivier, B.; Verster, J.C.; Kahn R.S.; Boks, M.P.M.; Kalenscher, T.; Joëls, M. (2013). Time-dependent changes in altruistic punishment following stress. *Psychoneuroendocrinology, 38*(9), 1467-1475.

von Dawans, B.; Fischbacher, U.; Kirschbaum, C.; Fehr, E.; Heinrichs, M. (2012). The Social Dimension of Stress Reactivity: Acute Stress Increases Prosocial Behavior in Humans. *Psychological Science,* 23(6): 651-660.

Zapf, D.; & Frese, M. (1991). Soziale Stressoren am Arbeitsplatz. *Psychischer Streß am Arbeitsplatz*, 168-184.

Empirical Strategy

1. Variables

Category	Variable	Scale	Description	Details	Specification
Public goods game	*contribute*	ratio	Unconditional contribution	Variable indicating cooperative behavior	Generate new variable *cooperative_behavior* (for robustness check) (0 = fight or flight if unconditional, and conditional contribution are zero 1= tend and befriend if unconditional and conditional contribution are ten)
	x_contribute	ratio	Contribution conditional on x contributed by other team members	$x \in \{1,2,\dots,10\}$ Variable indicating cooperative behavior	
	belief_contribute	ratio	Belief about average contribution of the other team members		
Coordination games	*y_inorm*	ordinal	Guessed modal answer category for question on social appropriateness of behavior in the five vignettes	50%; $y \in \{1,2,\dots,5\}$ Variable indicating cooperative norm perception	Generate new variable *inorm_score* (individual average score of the five vignettes on the perceived injunctive norm in the company), either indicating a cooperative norm perception or non-

					cooperative norm perception Scale: cardinal
	y_dnorm	ordinal	Guessed modal answer category for question on social appropriateness of behavior in the five vignettes	50%, $y \in \{1,2,\ldots,5\}$ Variable indicating cooperative norm perception	Generate new variable *dnorm_score* (individual average score of the five vignettes on the perceived descriptive norm in the company), either indicating a cooperative norm perception or non-cooperative norm perception Scale: cardinal
Survey	*team_cooperation*	ordinal	Need for cooperation among team members		
	team_cohesion	cardinal	Perception of team cohesion		
	n_competiveness	ordinal	Perception of negative competitive pressure among team members		
	p_competiveness	ordinal	Perception of positive competitive pressure among team members		
	team_stability	cardinal	Quantifiable team stability		average score
	perceived_team_stability	ordinal	Perception of staff stability within the team		

	stress	cardinal	Perceived chronic stress		
	big_five *Neuroticism* *Extraversion* *Agreeableness* *Conscientiousness* *Openness*	cardinal	big five personality measure		Individual average score for each personality dimension
	neg_reciprocity	ordinal	Social preference measure indicating the participants tendency for negative reciprocity		
	pos_reciprocity	ordinal	Social preference measure indicating the participants tendency for positive reciprocity		
	trust	ordinal	Social preference measure indicating the participants trust		
	competitive_attitude	cardinal	The participants individual competitive attitude		Individual competitive score
	donation	binary	Participants donation of his/her earned money from the study	If $donation = 1; yes$ (i.e. spend earned money to a charity organization) If $donation = 0; no$ (i.e. keep earned money for oneself)	
	children	binary	Indicating whether the participant has children or not	If $children = 1; yes$ If $children = 0; no$	

	friends	cardinal	The participants amount of friends		
Company					
Structural aspects	*team_size*	cardinal	Number of team members		
Socio-economics	*age*	cardinal	Age of employee		
	gender	nominal	Gender of employee		
Work-related characteristics	*career*	ordinal	Career level of employee (describes contribution based upon business results, accountability, complexity, experience and communication)	T1 (Associate); T2 (Specialist); T3 (Senior); T4PF (Expert); T4PM (Manager); T5PF (Chief Expert); T5PM (Senior Management)	
HR-Development	*performance*	ordinal	Performance rating by manager appraisal	If talk= 0: ; insufficient; progressing; successful; outstanding; extraordinary; if talk= 1: none;	
Incentives	*wage*	ratio	Yearly wage before taxes	Also from several years before (delta_wage)	
	spot	ratio	Amount of money received by a spot award		
	move	ratio	Amount of money received by a move award		

Anticipated empirical analysis/econometric models

For all below listed models we will make sure to control for multiple hypothesis testing.
In addition, we aim to test further interesting variables and potential interactions by means of explorative investigation.

Hypothesis	**Unit**	**Dependent variable**	**Main independent variable(s)**	**Further controls**	**Model**
1	Individual	*stress*	*team_cohesion,* *team_stability* *perceived_team_stability*	*team_cooperation* *team_size* *contribute* *x_contribute* *age, gender,* *children, friends, career* *big five*	Tobit, OLS as baseline
1a	Individual	*stress*	*n_competiveness*	*p_competiveness* *team_cohesion* *team_stability* *perceived_team_stability* *team_cooperation* *team_size* *contribute* *x_contribute* *age, gender, children,* *friends, career, big five*	Tobit, OLS as baseline
1b	Individual	*stress*	*inorm_score* *dnorm_score*	*team_cohesion* *team_stability* *perceived_team_stability* *team_cooperation* *team_size* *n_competiveness* *p_competiveness* *contribute*	Tobit, OLS as baseline

				x_contribute *age, gender, children,* *friends, career, big five*	
2/3	Individual	*Performance*	*stress*	*competetive_attitude* *wage, spot, move,* *n_competiveness* *p_competiveness* *team_cohesion* *team_cooperation* *team_stability* *perceived_team_stability* *age, gender, children,* *friends, career, big five*	Ordered logit
4	Individual	*stress*	*wage, spot, move*	*team_cohesion* *team_stability* *perceived_team_stability* *team_cooperation,* *team_size* *n_competiveness* *p_competiveness* *contribute* *x_contribute* *age, gender, children,* *friends, career, big five*	Tobit, OLS as baseline
5	Individual	*contribute,* *x_contribute*	*stress*	*team_cooperation,* *team_cohesion* *inorm_score* *dnorm_score* *n_reciprocity* *p_reciprocity* *trust* *n_competiveness* *p_competiveness*	Multivariate Tobit, Multivariate OLS as baseline

				competitive_attitude *belief_contribute* *big five* *age, gender, children,* *friends, big five, career*	
		donation	*stress*	*stress,* *inorm_score* *dnorm_score,* *contribute, x_contribute* *age, gender, children,* *friends, big five*	Logit
5a	Individual	*contribute,* *x_contribute*	*stress & gender*	*stress & gender* *team_cooperation,* *team_cohesion* *inorm_score* *dnorm_score* *performance* *n_reciprocity* *p_reciprocity* *trust* *n_competiveness* *p_competiveness* *competitive_attitude* *belief_contribute* *age, gender, children,* *friends, career*	Multivariate Tobit, Multivariate OLS as baseline
		donation	*stress & gender*	*stress & gender* *inorm_score* *dnorm_score,* *contribute* *x_contribute* *age, gender, friends, big five*	
5b	Individual	*contribute,*	*stress & inorm_score*	*team_cooperation*	Multivariate Tobit,

		x_contribute	*stress & dnorm_score*	*team_cohesion* *inorm_score* *dnorm_score* *n_reciprocity* *p_reciprocity* *trust* *n_competiveness,* *p_competiveness* *belief_contribute* *age, gender, children,* *friends, career, big five*	Multivariate OLS as baseline
		donation	*stress & inorm_score* *stress & dnorm_score*	*stress* *inorm_score* *dnorm_score* *contribute* *x_contribute* *age, gender, children,* *friends, big five*	
6	Individual	*belief_contribute*	*stress*	*trust,* *inorm_score* *dnorm_score* *age, gender, children,* *friends, career, big five*	Tobit, OLS as baseline